THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIX. No. 1773.] LONDON, MAY 4, 1897. [49TH YEAR. PRICE 6d.

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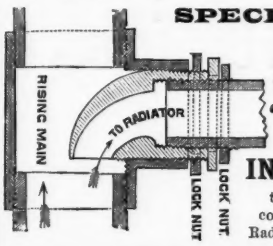

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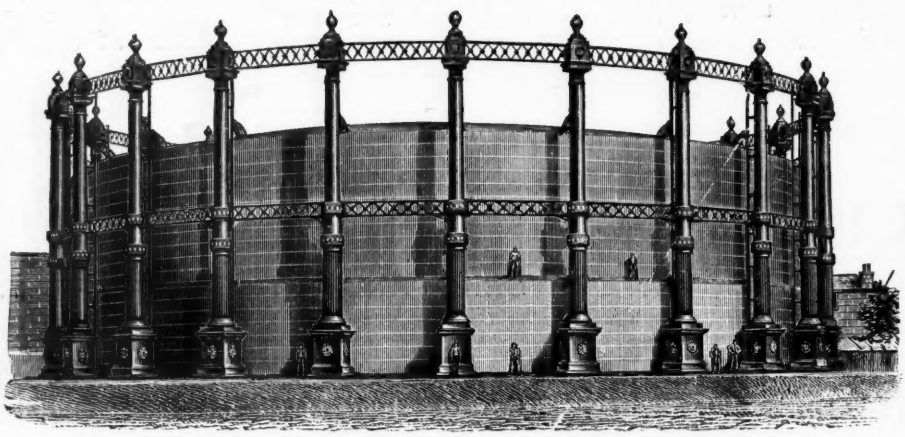

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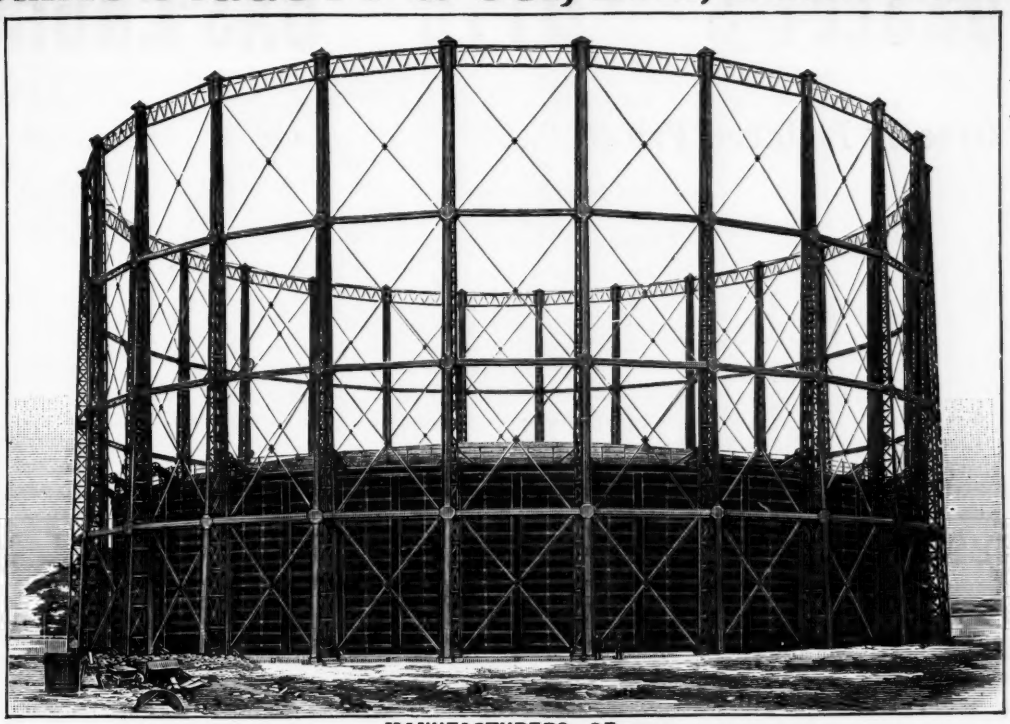

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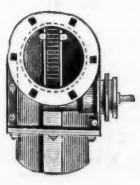

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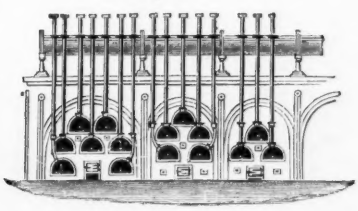

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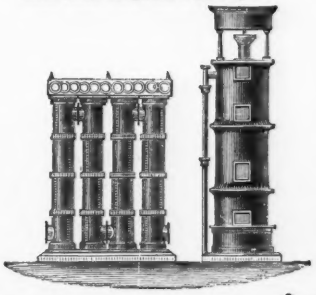

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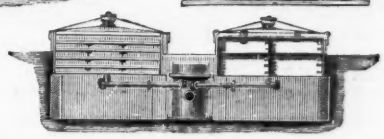

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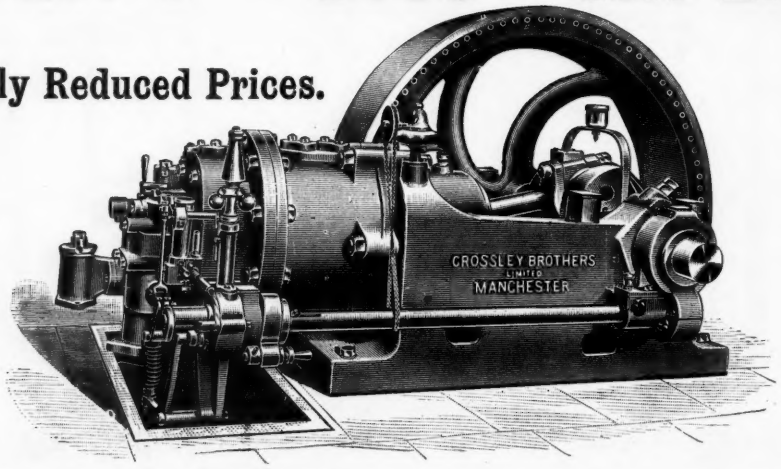

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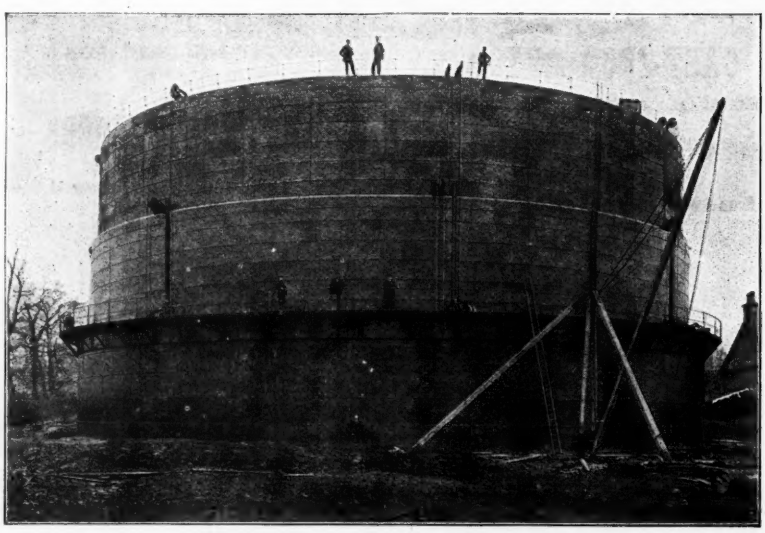

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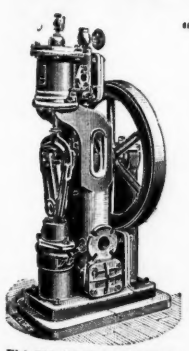

Fig. 703. "SINGLE RAM" STEAM-PUMP.

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

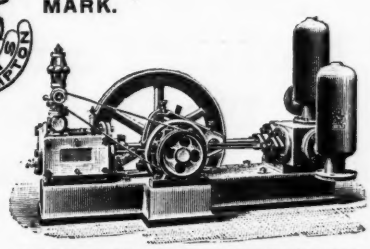

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

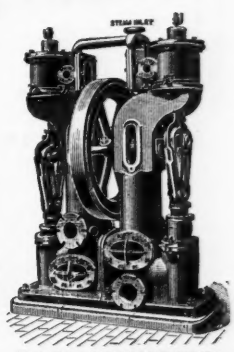

Fig. 712. "DOUBLE-RAM" STEAM-PUMP

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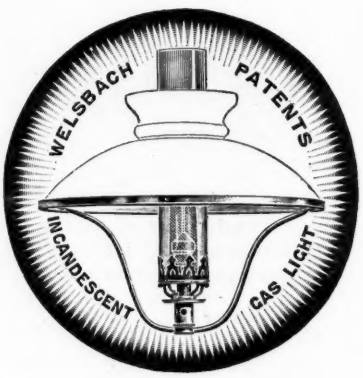
which, with a consumption of 1¾ cubic feet of gas an hour, gives

A LIGHT OF 30 TO 35 CANDLE POWER.

This pattern is particularly suited for Domestic Lighting, and is specially recommended where it is desired to effect a large saving in gas rather than to effect a great increase in the light.



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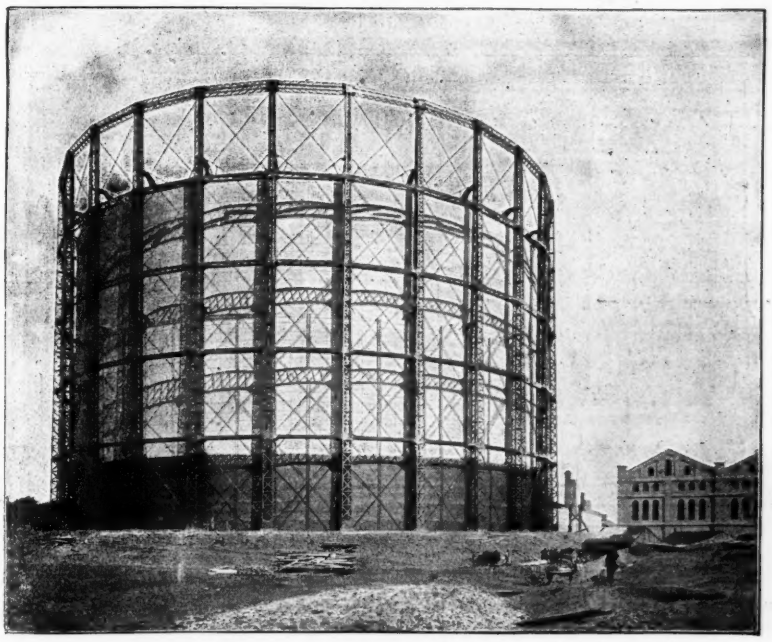
CUTLER'S PATENT CONDENSER.

CHARLES HUNT WASHER.



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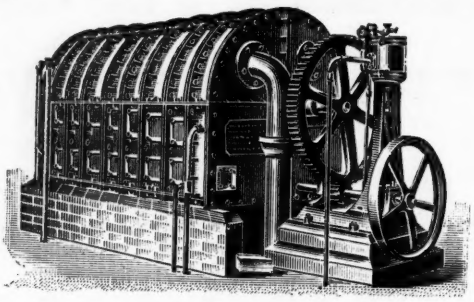
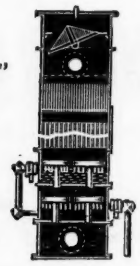


PATENT "STANDARD" VERTICAL SCRUBBER AND TAR-EXTRACTOR.



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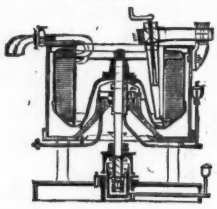

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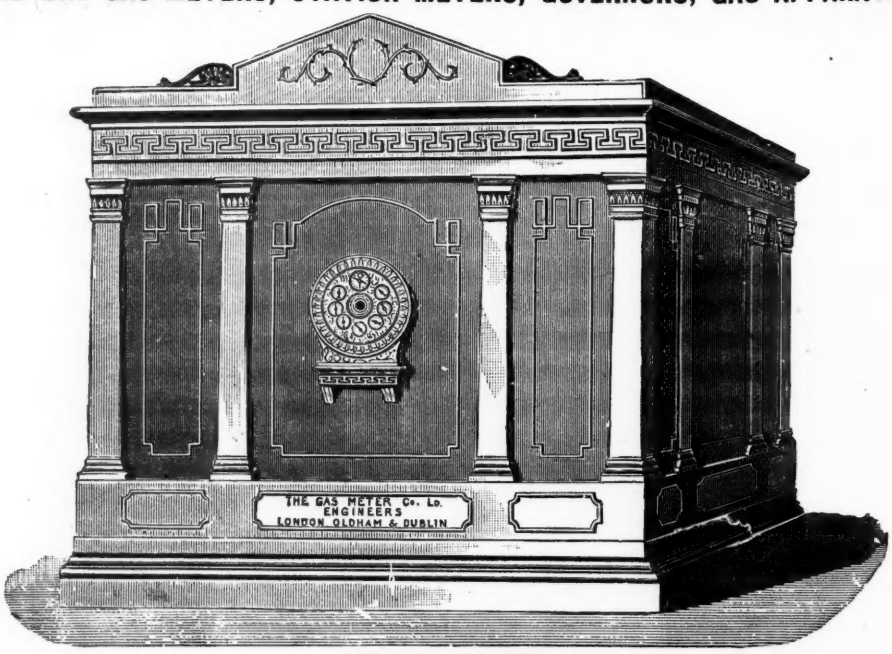

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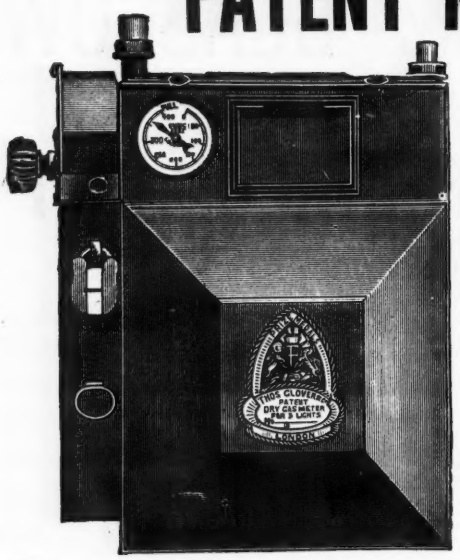

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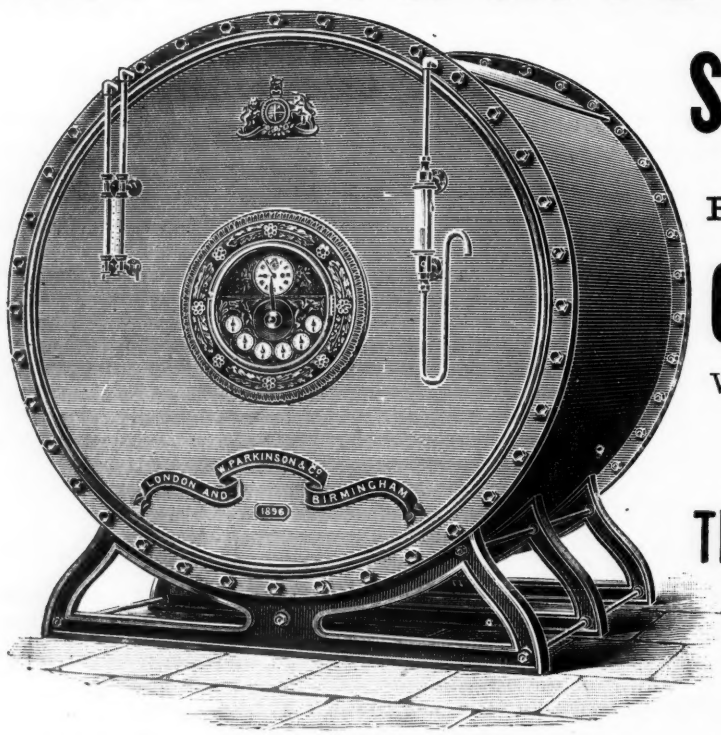

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EDITORIAL NOTES.

The Budget.

EVERY English newspaper and journal, technical or other, usually regards it as a duty to offer some comment upon the annual financial statement of the Chancellor of the Exchequer. We desire to be in the fashion this year, as usual; but there is, as a matter of fact, very little in the Budget speech to which we can draw the particular attention of our readers. Yet there is something in this address which is likely to appeal with special force to the consciousness of those who have to do with the British trade in illuminating gas. The Chancellor of the Exchequer found, to his surprise, when he came into possession of the returns from the Mint, that this establishment had been exceedingly busy during the past year—chiefly in turning out copper coin. Pence and half-pence numbering no less than 32 million pieces in all were coined last year; requiring the consumption for this purpose of 245 tons of copper—meaning by the last word, of course, what the ever-literal policeman calls "bronze." Moreover, "the "copper coinage of the year is more than three times as "much in value as that in the year preceding." The Chancellor of the Exchequer inquires the reason for this extraordinary fecundity of the Mint in the humblest variety of money; and he learns "that, in the view of the authorities of the Mint, not a little of the increase in the "demand for copper was due to the increased number of "articles . . . which may be obtained by the simple "process of putting a penny in the slot." Many gas managers would confess that a goodly proportion of these 245 tons of "copper" had passed through their collectors' hands; and although, in the majority of cases, the prepayment gas-meter system merely means the giving of change for a penny, the general opinion would still be that this is worth doing.

As citizens of the United Kingdom, our readers must have found much in the Budget speech to suggest deep, and, on the whole, not unhappy reflections. True, the income-tax is not to be reduced this year; but lives there any payer of income-tax so sanguine as to hope for any remission of taxation under this head? The taxation of the population of the United Kingdom is borne upon so few contributories, and the demands upon the tax fund are so heavy, and show such a marked tendency to increase in number, that there is not much prospect of the income-tax payer being let off a single penny. Sir M. Hicks-Beach made an effective point in his speech of the changed state of the national finances produced during the past sixty years. In 1836, the total revenue of the nation was 52¼ millions; last year, it was 112 millions. Sixty years ago, 71 per cent. of the revenue was raised by the taxation of commodities; last year, only 44 per cent. was so derived. Then, there were 1:35 separate rates of customs duties; and now the three articles of spirits, tobacco, and tea return within three-quarters of a million of the whole produce of the dues of the year 1836.

It is a favourite point of declamation with many of our modern Socialists that the course of civilized life has been to make the rich richer and the poor poorer. Let us see how this is borne out by the simplest test of taxation. In 1841, it was reported to the Poor Law Commissioners that an agricultural labourer paid in taxation on articles of consumption the equivalent of 3½ weeks' wages a year. Now he would pay, on the same articles, less than one week's wages—assuming the rate of the latter to be the same. During the past sixty years, the volume of British trade has increased sixfold. "Out of this enormous expansion "of industry, has come great and permanent benefit to "the working classes." Savings-Bank deposits have risen from 18¾ millions to 155 millions. The expenses of the nation, while actually increased in many respects, are both actually and relatively lighter in others. Sixty years ago, the National Debt cost annually in interest alone 21s. 8d. per head of the population; now, the burden is only 9s. Then, the total amount of the national indebtedness was £33 9s. 3d. per head; now, it is diminished by one-half. One result of the change is that Consols have so risen in value that, whereas in 1836 a man could buy a permanent income of £3 a year by investing £89 10s., nowadays he has to pay £121 10s. for the same return. It is not within our province to say much about the reform of the postal service, to which the Chancellor of the Exchequer has

appropriated £366,000 of his expected surplus, except to remark that all readers and writers of letters, newspapers, books, and telegrams throughout the kingdom are likely to remember the present year as that of the inauguration of more liberal reforms in the matter of postage than were to have been hoped for from the spontaneous action of any Government Department. Thus, on the whole, the British public have little reason to complain either of the weight or the incidence of Imperial taxation, which is considerably less in amount than the local rates.

The Workmen's Accidents Bill.

The Workmen's Accidents Bill was to have been introduced last night by the Home Secretary; but it is, of course, impossible for us to say anything now with regard to the fact. We have discussed this subject generally on more than one occasion, and find ourselves in harmony with most of those who have studied it upon its merits, which is not the case with everybody who professes to know all about the wants of the working classes. According to some writers upon the subject, no legislation in the interest of the workman is likely to do him any good unless it inflicts serious injury upon the employer. Others there are who esteem the Trade Union leaders as the sole depositaries of wisdom in this regard, to the extent of holding that what Mr. Sam Woods, M.P., or somebody like him, does not approve should be put aside at once. We do not believe, however, that the Home Secretary is at all likely to take an extreme view of the interest of either employers or workmen in the vexed question of the right of "contracting out." The late occupant of this high office, as is well known, accepted a brief from the Trade Unionist supporters of the administration of which he was a member, apparently oblivious of the consideration that the *bona fides* of his clients was not above suspicion. At their bidding, he brought in a Bill to abolish the doctrine of common employment and to prevent contracting out. He failed to pass the measure; and the present Government came into office pledged to find another solution of the problem. This pledge the Home Secretary has now to redeem. The task should not present any insuperable difficulty. Nobody wishes to preserve the doctrine of common employment in all its crudity; but, on the other hand, no fair-minded individual wishes to place an employer under greater disabilities in regard to his responsibility to his workpeople than he can accept as incidental to his occupation. Accidents to workmen ought, as far as possible, to be prevented. This sounds like a truism; but the more the subject is investigated, the clearer does it appear that the recognition of this principle lies at the root of all schemes of legislation upon the matter. Contracting out as between parties of equal freedom of action is, moreover, a different thing from the sort of contracting out that goes on in some employments. There is something repugnant to English ideas of liberty in the conditions under which some employers will alone engage their labour; and one's respect for the benevolent character of the sick and accident funds of some industrial establishments is not heightened by their compulsory nature. There is a good deal to be said for such arrangements of the kind as are based on the general idea of compensating everybody coming within the scope of their operations, "and no questions asked." No really humane or generous employer would be extreme to interpret the saving clause which excepts the victims of "contributory "negligence" from relief under all schemes of legislation. A tired man nods momentarily over his desk in the office, and nothing comes of it. If he does the same thing on a scaffold, life or limb may be the penalty. Probably most of the respectable opposition to contracting out would cease, if it could be shown that in the rare eventuality of the circumstances warranting it, the Courts might override any arrangement of the kind. All that is wanted to arrive at a generally satisfactory amendment of the law in this regard, is perfect candour, and absence of ulterior motives, on the part of whomsoever has to do with the business.

The Result of the Conference of the Engineering Trade.

The Employers' Federation have issued a statement, addressed to the Amalgamated Society of Engineers, with regard to the actual results of the recent Conference. The statement is signed by Colonel Dyer, of Elswick, who presided over the Conference; and the object in making it seems to be to remove any shadow of doubt as to the position of the associated employers on the question of machine labour. With this view, the circumstances that led up to the present position of affairs in this regard are carefully recounted; and it is noted that the only suggestion for dealing with the question, offered on the part of the Amalgamated Society of Engineers, is that for the appointment of local joint committees of employers and members of the Society. This suggestion was rejected by the employers' representatives at the Conference; and the statement now published makes it quite clear that the masters, upon further consideration, are firmly resolved not to admit in any shape the proposition that their absolute discretion in the selection of the men to work their machines, and other matters pertaining to the management of their business, should be delegated to any external authority. The employers are under no delusion as to the character of the suggestion offered by the Trade Union; and they have deemed it advisable that there should be equal certainty in the minds of others that no such solution of the question will be entertained now or at any future time. The statement proceeds to remind the Amalgamated Society of Engineers that they are not everybody. "The necessity laid upon the employers, of "considering the large number of men belonging to other "societies, or to no Trade Society, has also to be borne "in mind; while efforts now being made in this country "to foster a higher class of skilled artisans than heretofore, "by imparting technical instruction, render it imperative "that the employers in the national interest, should be free to "encourage ability wherever they may find it, and free also "to select the most suitable men for the various operations "carried on in their workshops." The Union is reminded, parenthetically, that a struggle against the progress of legitimate methods for cheapening the cost of production must in the long run be hopeless. In conclusion, the employers' ultimatum repeats that "the direct issue to the "employers is as simple as it is vital; and they have no "difficulty in arriving at the decision that to the employers "must always be left the question of selecting the men and "apportioning the work." This statement, therefore, constitutes the charter of the right of free labour, conditioned only by technical and economic necessity. It is to be hoped that the leaders of the Amalgamated Society will perceive its righteousness, and acknowledge its force; for it must be maintained, if the need arise, at the cost of shutting up every engineering workshop in England. The federated employers remind the Union that there was no difficulty at the Conference in dealing with the various questions of wages and hours of work which were raised on that occasion. These points were disposed of one by one, to the advantage of the men, and in a spirit of amity and fairness that left nothing to be desired in this respect. So far, the Conference proved a highly efficient and expeditious agency for conciliation; but the reservation of the questions of principle, exhibits once more the essential limitations of all organizations of the kind.

The House of Commons on Plumbers.

In the House of Commons on Friday, Mr. Knowles, the member for West Salford, moved the second reading of the Plumbers' Registration Bill. The motion gave rise to a brief debate; Mr. Whittaker, a Yorkshire county member, objecting to the measure, as creating something approaching a monopoly, and also as calculated to mislead the public. The honourable member argued that to impose fees upon persons before they were allowed to enter a trade, is to form an organization similar to that which rules the legal profession; and this, he contended, is particularly objectionable in the case of a trade. It was also pointed out that the Bill gives no security against the employment by masters of bad workmen, which is where the only danger to the public comes in. Upon general principles, Mr. Whittaker contended that the public health is better looked after by surveyors and sanitary inspectors; the creation of registered plumbers only serving to impose a false sense of security. To these arguments, Mr. Knowles was only able to urge that a similar Bill had been read a second time in two Parliaments; and reported on favourably, as to the principle, by a Select Committee. It was further explained that the Bill does not in any way contemplate the establishment of a monopoly in the plumbing trade, but only created an order of registered workmen who would be at the disposal of those who appreciated this kind of guarantee. After several other members had expressed general approval of

the Bill, it was resolved to send it to the Standing Committee on Trade; so there is at least a chance that it may become law this session. We cannot be accused of a desire to depreciate the efforts of those well-meaning persons who would provide plumbers with an opportunity for obtaining a degree. Mr. Sam Gerridge, "R.P.," is welcome to the statutory handle to his name, if he can get it, and has any preference this way. At the same time, it is just as well to understand whither all this Parliamentary intermeddling with the conditions of employment is leading us. The estimable three-branch hand is to have his degree; and the engine driver is to have his certificate. But where is the line to be drawn? If the public security is only to be preserved by this means, is not the ability to take care of a horse and cart, or even to ride a bicycle with due regard to the safety of other users of the Queen's highway, as well worth the attention of Parliament as the foregoing industrial operations? With regard to the elevation of the standard of plumbing and gas-fitting, there is a good deal to be said for the view that these are cares that had better be left to municipal authorities. There is no special danger in bad plumbing, except in connection with public sewers and water supply; and it is bringing the Imperial Parliament into ridicule, to occupy its time and attention with such a matter. If a general provision were passed that local authorities might make their own bye-laws for the regulation, not merely of dangerous and noxious trades in their midst, but also in regard to whatever trades might be deemed to need supervision in the public interest, these spasmodic legislative proceedings would be rendered unnecessary, as they are obviously undesirable. One repeatedly hears pleas, in and out of Parliament, for the delegation to local authorities of greater powers for disposing of business that may be regarded as coming legitimately within their proper sphere; and yet time and again Parliament is found doing, or neglecting to finish, petty legislative work such as that to which Mr. Knowles has invited it. On Friday, immediately after referring the Plumbers' Bill to the Standing Committee on Trade, the House of Commons was asked by a member to remedy certain small defects in the Local Government Act of 1894. But this was too much for our legislators, who allowed themselves to be "counted out" rather than do another stroke of work. So the collective wisdom of the nation understands its responsibilities.

Gas Traction for Tramways.

THE report that a further extensive trial of the gas-traction system for working tramways is about to be undertaken at Ipswich, is cheering to those who entertain a rooted objection to seeing the main thoroughfares of British towns and cities overrun by an overhead electric trolley system. There must be many localities in the United Kingdom where tramways have failed to return a profit on working by horse traction; and the gas-traction system might be hopefully applied to some of these. It is reported from the United States that tramway working by compressed air locomotives is superseding the trolley-wire system for crowded centres; and on the face of it, there does not appear to be any reason why gas power should not answer at least as well as compressed air. The two latter methods of driving tramcars have several principles in common; and where they differ, it is questionable which is to be preferred. The circumstance that the expected development of mechanical traction on common roads has not taken place, has operated to throw the whole question of the application of mechanical power to the simpler problem of tramway working into the shade. The two things, however, are not really connected; still less interdependent. It is to be hoped that gas-driven tramcars, although slow in coming to the front, will not repeat the *fiasco* of the road motors; but that when they do come, it will be to stay. There is plenty of room for them. We do not imagine for a moment that the adaptation of the gas motor to the working of tramways will make much difference to the receipts of the gas undertakings where the experiment succeeds; but we desire to see gas doing all that is possible for the benefit of the community.

Manchester District Institution of Gas Engineers.—The Committee of the Institution are arranging the next quarterly meeting for Saturday, the 22nd inst.—instead of the usual last Saturday in the month. The meeting will be held at Preston, where a visit will be made to the gas-works.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1006.)

THE past week showed a better tendency at once upon the opening of the markets. The intelligence from the seat of war gave good promise of a speedy termination to hostilities; and it brightened things up considerably. Business, however, kept very quiet, especially in the more speculative quarters, though a fair amount of buying for investments went on. Good trade and traffic prospects materially aided rails to improve their position. Another agreeable factor was the exposition of affairs in the Chancellor's Budget speech; and but for a very slack attendance on Friday (Saturday being an annual May holiday), prices would probably have had a considerable fillip up. This, however, is perhaps only deferred a day or two, especially if we get the right news from the East. The Money Market presents no new feature; and the Stock Exchange settlement was much too light to have any effect upon it. Business in Gas was at first very quiet; there being apparently a scarcity of stock through sellers holding back. But better prices being bid later on, there was more animated dealing. Quotations of some of the leading issues have had a substantial rise; while the general tendency all round was buoyant. Gaslight "A" was stronger from the start, opening at 305; and the price hardened every day, though transactions in the earlier part of the week were not numerous. Before the close, stock had changed hands at 311. Only a little was done in the secured issues; and the quotations did not move. Moderate business was transacted in South Metropolitan, which was rather inclined to rise when the week closed. The converted 3 per cent. debenture stock is now quoted; the price being the equivalent of the unconverted 5 per cent. stock as last quoted. Very little was done in Commercials; but just at the end, prices were advanced. Business in the Suburban and Provincial group was quite a blank. Not much was effected in the Continentals; but Imperial had a smart advance, pushing quickly up from 213 to 220½—the best figure touched for a long while. The only other change was a rise in Hong Kong. Business in Water was pretty good; and prices were steady generally. East London had a slight fall; but Lambeth advanced on the prospect of another ¼ per cent. dividend.

The daily operations were: The Gas Market opened quiet on Monday, but was very strong. Gaslight "A" advanced 2; and Imperial Continental, 3. Business in Gas remained extremely restricted on Tuesday; but prices continued to rise freely. Gaslight "A" gained 1; and Imperial Continental, 4. Wednesday brought a disposition towards greater activity, coupled with continued firmness. There was a further rise of 1 in Gaslight "A"; and Hong Kong advanced ½. In Water, Lambeth rose 2. Thursday's business in Gas showed a great improvement; transactions being lively, and prices buoyant. Gaslight "A" moved up 2 more. East London Water receded 2. Friday also was a fairly active day; and pretty well everything commanded good figures. Commercial old rose 5; and ditto new, 3. The Stock Exchange was closed on Saturday.

ELECTRIC LIGHTING MEMORANDA.

Electric Lamp-Posts in the West-End—Defective Art in Lamp-Post Design—Supineness of Artists—Shortcomings of Electric Lamp Fittings.

THE operation of installing electric lamp-posts in Regent Street and Pall Mall is well advanced; and in due time we shall probably hear this extension trumpeted forth as one of the triumphs of the "record reign." Meanwhile, complaint has already been made of the ugliness of the posts. A letter from "An Artist" has appeared in "The Times," in which the writer declares that "those who have observed the exquisite artistic proportioning of design, beauty of detail, and refined work in casting displayed in the public standards for the lighting of Paris and other Continental cities, cannot do less than recoil in amazement at the atrocities in metal now erecting for the electric lighting of Regent Street." This is putting it pretty strongly; but there is worse to follow. "Work of the kind more vulgar in conception or coarser in production, cannot be conceived; and yet we are living at a time of mania for art training, so called, conducted at enormous cost of public money at South Kensington and its manifold branches throughout the country." The irate artist concludes by asking why it is that our parish authorities and contractors are permitted thus to disfigure our principal thoroughfares, to justify foreigners in their scorn of our art ignorance, and to "make us thoroughly ashamed of ourselves." Then the querist pauses for a reply which has not, to our knowledge, been vouchsafed to him by those whom he addresses. As our readers will hardly need reminding, this matter of the artistic treatment and subsequent care of street-lighting fittings has frequently been discussed in the editorial columns of the "JOURNAL," without practical effect. We are not concerned to deny that the new West-End electric lamp-posts leave something to be desired by those who are jealous for the respectful treatment of the principal thoroughfares of a Metropolis which in many other respects is striving to add a touch of grace to its inherent impressiveness of another kind; but what is to be looked for in the circumstances?

London is the free capital of a free country. There is no central authority to lay down rules as to how the streets shall be equipped with whatever may be necessary for the service of the highway. The most fashionable and lordly, as well as the most obscure thoroughfares are paved, cleansed, and lit by local authorities the very existence, names, and districts of which are unknown to the vast majority of the public for whom they cater in these respects. The great and powerful Imperial Government cannot put up or remove a single lamp-post in Regent Street, and has no voice in the determination of the manner in which it shall be lighted. A humble District Surveyor and his Committee, acting in concert with the lighting contractors, do all this kind of work literally according to their lights; and that authorities exercising such limited rule, and disposing of such narrow means, should do so well is more wonderful than that they should not be able to effect all that is achieved by the supreme and autocratic rulers of foreign capitals. At the same time, there is very good ground for the complaint that the London streets, and not the London streets alone, do not get in many respects the best treatment possible, even under the actual conditions. As regards the applications of art, for example, to street lamp-posts, fountains, and the like, we are unquestionably content with too low a standard. The correspondent of "The Times" asserts that foreigners are justified in their scorn of our art ignorance, and that they thus "make us thoroughly ashamed of ourselves." Unhappily, the latter effect is just what is lacking as a stimulus to improvement. The English people are not remarkable for the possession of artistic tastes. The great majority of us are insusceptible of the smallest valid art teaching. Not all South Kensington and its branches, multiplied tenfold and endowed with more money than they are ever likely to wring from the Treasury, will serve to teach the mass of the people what they ought to admire and what to reprobate in art pure or applied. This is the great fundamental factor in keeping our cities ugly.

In France it is possible to say, with some approach to truth, that "all the world is a bit artistic;" but this cannot be truly claimed for England. South Kensington can teach people how to draw; but nothing can teach a man what to draw, unless he can discover the motive in himself. How can one expect good designs for street lamp-posts to be produced by the South Kensington system? What can be done, however, without much trouble is to put our highway authorities into sympathetic relationship with the best art feeling of the age, as it is to be found, not in elementary drawing schools, but in artists. In order to do this, the artists must meet the authorities half way. It is utterly useless for indignant art critics to write to the newspapers protesting against what is being done by those busy people of the world of action who have to do something as they best can, while the superior persons are all of them dreaming and talking. Where is the living artist who has produced an actual design or model of what a street lamp-post suitable for nineteenth century use should be? Let us have the artists' suggestions first; and then we may be more patient of their criticisms. Not the smallest of the difficulties which environ a local authority who should desire to act in an enlightened spirit in regard to street adornment, is that of knowing who to trust. If they start a prize competition, they are told that this is not the proper way to get good designs for anything. If they give a commission to a selected designer, the chances are that the result will be scoffed at by every other artist—at any rate, by all those who do not belong to the same "school" as the chosen one. And all experience shows that the artistic temperament, where it undoubtedly exists, is liable to show obstinate disinclination to adapt its creations to the practical requirements of every-day life. Of course, this is rank Philistinism; but it cannot be denied that the weakness satirized by the poet when he twitted architects with a fondness for "rich windows that exclude the light, and corridors that lead to nothing," is still too much in evidence. Renowned artists have made street drinking-fountains that could not be put to the purpose intended; and we have seen some specially designed lanterns that certainly failed lamentably to fulfil their office.

Electricians, moreover, as we have repeatedly pointed out, in their lantern fittings are far greater sinners against the canons of taste than even the despised gas engineers. If one takes up any of the electrical journals, and glances at the advertised lamp fixtures, the conviction is forced upon one that the development of science and art in these articles of trade has been singularly unequal. To say nothing of the atrocious candle-lamp, there is no indication in current price lists of electric light fittings that the outlay of any amount of money upon these by no means inexpensive articles will secure a pleasing result, to say nothing of an artistic triumph. Nor do the preparations made by the manufacturers of special illumination fittings for the forthcoming celebrations inspire one with the hope of seeing anything both good and new in this line. Indeed, so far as can be gathered, the use of electric lighting for purely decorative purposes has made little, if any, advance in methods since the memorable South Kensington exhibition displays; which is probably due to the persistence of the great obstacle of expense. Coloured incandescent lamps for the illuminations appear to be the greatest novelty of the kind; and the effect of these will after all be only an imitation, without the grease, of the traditional Vauxhall illuminations of the early part of the Queen's reign.

THE ENGINEERS' DISPUTE.

THE pending disagreement between the associated employers in the engineering trade and the Amalgamated Society of Engineers (the A.S.E.), over the question of what class of worker should attend upon certain machine tools, is of such great and far-reaching importance, in respect to its bearings upon the whole range of mechanical industry in this country, that we deem it expedient to devote more space to the discussion of the matter than can be spared in the columns appropriated to current "Editorial Notes." As our readers are aware, this question of machine working entered upon the acute stage recently at a Sunderland shop, and was referred to a Joint Conference of federated employers and members of the A.S.E. opened in London on the 1st and 2nd ult. The A.S.E. had claimed for their members the sole right to work certain machine tools—namely, band saws, boring machines, grinding machines, and so forth—to the exclusion of non-Society men, and men belonging to other Societies. The first two days of the Conference were occupied in ascertaining from the delegates of the A.S.E. what were their specific claims in this regard, and in discussing the respective positions of masters and men. It appears from information supplied to the Conference, that the A.S.E. did not move a moment too soon, if they desired to sustain in action their ideas of their members' rights. Indeed, it is more to the point to say that these ideas are already sadly belated.

As expressed in their own words, the principle adopted by the A.S.E. is that their members ought to have the monopoly of working at any machine made by their trade, or used in their trade. This claim is ostensibly based upon the conviction that no machine can be as economically and successfully worked by what the A.S.E. style unskilled or semi-skilled labour—*i.e.*, the labour of men outside their organization—as by skilled labour; meaning that of their own men. Tested by reference to facts, this contention is very slightly founded. Information has been given of the state of things existing in a particular establishment in the North of England represented at the Conference. Here, in a shipbuilding department employing 286 machines, the number worked by engineers is only 20—or some 7 per cent of the whole. In the engineering department, out of 424 machines, 71—or 16·7 per cent.—are worked by engineers, not all A.S.E. men. It therefore argued a high degree of courage on the part of the A.S.E., to put it mildly, that they should have made a point of turning out all these other machine hands, and supplanting them by their own members.

As soon as intelligence of what the A.S.E. were demanding spread in the localities most affected, "the fat was in the fire." The United Machine Workers' Association, by the General Secretary (Mr. Matthew Arrandale), sent a letter to the Secretary of the North-East Coast Iron Trades' Employers' Association, demanding to know why they were to be turned out of their employment at the bidding of the engineers. Mr. Arrandale accused the A.S.E. of desiring to stamp out his Society, with a view to the aggrandisement of their own, and said several other unpleasantly pointed things about the A.S.E. He also desired that, if the employers consented to the constitution of any committees for the settlement of disputes concerning the working of machines, his Society should be represented upon such committees.

Meanwhile, however, the Conference was progressing (without Mr. Arrandale's assistance) to a deadlock, which can only be terminated by the withdrawal of the A.S.E. from an untenable position. It soon appeared after the Conference began that there was a difference of opinion between the masters and the A.S.E. as to the meaning of the terms skilled and unskilled men. The Society view of the matter was that none but their own members could be properly described as skilled men; and they did not consider that any man should be classed as an engineer unless, as a boy, he had served an apprenticeship of at least five years. Colonel Dyer, who took the chair at the Conference, had no difficulty in driving the A.S.E. from this position. The General Secretary, indeed, confessed that the Society did not feel very strongly on this point, inasmuch as if a man has worked four or five years at the trade, "no matter at what age he started," he is admissible to membership of the A.S.E. This is precisely one of the points made by Mr. Arrandale against the Society—that they consent to take in mere drillers, and thereby render them eligible, upon their own standard, to attend the very machines which they are not supposed to be fit to touch without this supreme qualification. Then Colonel Dyer proceeded to drive home his contention that, from the employers' point of view, what renders a man a skilled worker is not membership of this or that Trade Society, but ability to do the work which is set before him. It seems a strange result of trade organization, that this common-sense view of what constitutes the efficiency of a worker should be so completely ignored by those who profess to represent workmen. It is not the fault or the merit of the employers involved in this particular dispute, that they appear to identify their cause with the teaching of reason and experience; while their opponents talk the language of prejudice, obscurantism, and reaction. Nor is the A.S.E. consistent; for whereas they now claim for their members the monopoly of working self-acting machines, there was a time when they were resolutely set against having anything to do with them. This latter was, as everybody knows,

the usual attitude of the skilled workman in every trade towards the self-acting machine. And in this he was more justified than is the man who adopts the later A.S.E. position; for if a self-acting tool is worth anything at all, it does not require a skilled workman to look after it. It would be the death of a really skilled worker to put him upon a machine that a boy or girl fresh from school could learn to tend in a day.

Worsted upon this point, the A.S.E. next raised the favourite Trade Union idea, that the introduction of machines is an employer's device to save wages. Pay the machine-minder skilled men's wages, they cry, and our objection to him will cease. But why should the employer do this, when the man is admittedly unskilled? Here another fallacy peeps out—that a worker deserves to be classed as skilled, if the employer can be induced to pay him skilled man's money. Again, the common-sense side of the question is lost sight of by the Trade Unionist, and remains with the employer.

After the subject had been discussed at great length without arriving at any decision, the Conference was adjourned for eleven days, to enable the A.S.E. to formulate their plan of dealing with employment on machines. When these proposals came before the meeting, they were found to consist in the lame suggestion that all questions of the kind should be referred to Local Joint Committees, composed of equal numbers of employers and A.S.E. members, with an independent Referee. To this communication, a reply was returned to the effect that the federated employers could neither accept such proposals nor offer counter suggestions on the same lines. In the public interest, and in that of all parties concerned, the employers said they could not consent to such a subversion of the whole order upon which the engineering industry has been founded and developed. This is final. In all probability the A.S.E. will go on making trouble in the trade, until a big strike settles both the principle and the Society. But with the record of the late Conference before the world, it will be impossible for the men to contend that their case has not been heard.

PERSONAL.

After some forty years' service with the Crystal Palace District Gas Company, Mr. ARLISS, the Chief Clerk, has just retired from his position.

Mr. G. H. T. FOSTER was appointed to the dual position of Secretary and Solicitor of the Colwall Gas Company, at the first statutory meeting of the shareholders last Thursday.

Mr. HENRY GILES, late foreman at the Saltley Gas-Works of the Birmingham Corporation, who is leaving the city, was last week presented with a handsome gold watch, suitably engraved. The subscribers numbered no less than 423.

Mr. ROBERT HOLLAND, who for some years past has been Chairman of the Gas Committee of the Salford Corporation, has tendered his resignation. It is understood that his determination to resign has been influenced in some degree by the decision of the Council to place the gas and electric works under the control of separate Committees.

Mr. HENRY CARRUTHERS, who has retired from the position of foreman of the engineering department at the Lambeth Water-Works, has been presented with a gold watch by the employees; the inside of the watch case being inscribed: "Presented to H. Carruthers, Esq., from the employees of the Lambeth Water-Works and friends, on his retirement after 21 years' service."

OBITUARY.

The death has just taken place at the age of forty-two of Mr. G. T. GREEN, of Sheerness, who was a Director of the Sheppy Gas Company.

We regret to hear of the death of Mr. J. R. SHOPLAND, M.Inst.C.E., who was connected with many engineering undertakings, among which may be mentioned the water-works at Naples, the Bridport water and drainage works, the water and drainage works at Clifton-on-Teem, Worcestershire, the Purton Water-Works, and the extension of the Swindon Water-Works. He was also largely consulted in railway schemes.

The death is announced as having taken place last Tuesday of Mr. RICHARD CHRIMES, of Rotherham, the founder of the firm of Guest and Chrimes; the other original partner being Mr. John Guest, F.S.A., the Rotherham historian, who retired from active work in connection with the firm as long ago as 1865. Mr. Chrimes himself retired 21 years later; and in 1886 the business was transferred to Mr. G. Eskholme, J.P., and Mr. C. E. Chrimes, a nephew of the deceased gentleman. Mr. Richard Chrimes was in no sense a public man. He never sought honour or distinction in connection with any of the local bodies, but lived a quiet, unostentatious life, doing good and administering charity in an unassuming yet handsome manner. As an employer of labour, he is kindly remembered; and many of his men have had reason to be grateful for kindnesses in the shape of grants or pensions when overtaken by sickness or old age. Mr. Chrimes, who had almost reached his 80th year, leaves a widow—daughter of the late Mr. George Myers, of Rotherham. There are no children; but Mr. P. H. Craven-Chrimes, of Plumtree, near Bawtry, a nephew, is the adopted son. The funeral last Friday was attended by upwards of 300 men from the firm's works, including the heads of the various departments and members of the office staff.

NOTES.

Pease's Fireproof Construction.

At the recent Builders' Exhibition at the Agricultural Hall, Islington, Pease's Tubular Construction Syndicate, Limited, showed some interesting developments of Pease's patent concrete and tubular metal fireproof construction. The most important of these were different patterns of flooring and partitions. It is claimed that by this system the cheapest iron-trough flooring, and the lightest and strongest wide-span flooring, can be constructed. The trough flooring is very simply made. It consists of a row of 6-inch sheet iron tubes, of 20 B.W.G. metal, filled with coke breeze concrete brought to a flush surface on top. The floor is thus made 7 inches thick over all; and with 10 feet spans, it will carry 3 cwt. per square foot as the safe load. It costs about 10s. 6d. per square yard. A similar floor, 20 feet span, weighing 11 lbs. per square foot, bore a load of 252 lbs. per square foot with only a slight deflection. The ends of the floor were supported, but not built in. Various modifications of this system of construction can be easily made to suit particular purposes. It appears to be well adapted for temporary buildings; being as cheap as galvanized iron, and much more habitable.

Acetylene for Laboratory Use.

Mr. A. E. Munby, of the Laboratory, Felsted School, Essex, sends to "Nature," a description of his method of using acetylene for blow-pipe work and in atmospheric burners. He thinks his experience ought to be interesting to those who have laboratories in the country, or where common coal gas is not obtainable. He uses an ordinary bunsen burner of special dimensions, with a very small jet for the gas; and he finds it expedient to cover the burner-tube with a cap to exclude dust, when the burner is not in use. The acetylene is generated under about 7 or 8 inches water pressure. With 6 inches pressure, a perfectly clean flame of good size can be obtained. The flame burns steadily and noiselessly, with a consumption of about 1 cubic foot of the gas per hour. He finds the flame possessed of great heating power; "one volume of acetylene being for practical purposes nearly twice as effective as one volume of ordinary gas." This means an immense saving of time in all heating operations; and in many cases the use of a blow-pipe can be dispensed with—the burner alone being quite hot enough for small fusions and simple glass-making operations. Mr. Munby gives the warning that the cocks and general fittings for acetylene should be thoroughly good; and he declares that "anyone who has not gone into the matter, will be surprised to find what an indifferent article, as regards leakage, is the average gas-cock." He finds that the cocks tend to work stiff—probably on account of the absorption of the acetylene by the lubricant; and he much desires that the question of the most suitable lubricant should be investigated.

A Petroleum Vapour Burner.

Mr. J. S. V. Bickford, of Camborne, has been describing in the "Engineer" a device for burning petroleum atmospherically. His aim was to produce a silent, smokeless flame of oil, suitable for steam raising; and he claims to have achieved a considerable amount of success in the attempt. Along a piece of gas-barrel, a number of holes are to be bored about 1 inch apart. The pipe being laid horizontally, with the holes on top, a truncated V boxing of sheet iron is placed over it. This is made simply of two strips of iron inclined to one another edgeways, at an angle of about 75°, but not meeting by about $\frac{1}{4}$ inch. The lower edges of the box are clear of the pipe, so as to allow air to pass in. If now a steady supply of petroleum vapour be sent into one end of the perforated pipe, the other end being closed, it will escape at the holes, and could be ignited at the apex of the surrounding conical casing, where it would burn with a clear, smokeless flame. Unfortunately, Mr. Bickford speaks of the burner as being supplied with petroleum vapour, without stating how the vapour is first to be generated from the oil. This is an important omission, inasmuch as it prevents one from regarding the burner as an appliance for burning petroleum itself smokelessly and silently. If petroleum of the ordinary grades could be easily burnt in this way, either without a blast or with only such a self-contained blast arrangement as exists in the Wells light, industrial applications of this kind of fuel would be greatly extended.

Subjective Colour Phenomena.

Some observations on subjective colour phenomena have been published by Mr. Shelford Bidwell, who has discovered various simple ways of performing certain experiments illustrating the formation, under stated conditions, of transient bands of colour along the boundaries between light and dark surfaces. Let a hole, half an inch square, be cut with a sharp knife in the middle of a sheet of thick brown paper about 15 inches square. The hole is to be covered with a piece of the gummed white paper taken from the edge of a sheet of postage stamps, thus forming a small translucent window. Across the middle of the window, a common pin is to be fixed, like a bar, by means of narrow strips of stamp paper at its two ends. Holding the brown paper in the left hand between the eyes and a lamp, the observer looks at the window steadily; then he conceals it from view by interposing an opaque screen, which may be a book. After a few seconds, and without moving the eyes in the meantime, he suddenly withdraws the screen.

Then, for a few moments, the window will appear to be surrounded by a narrow red border; while the pin will also at first appear bright red. The effect is best seen when the lamp is at a certain distance from the brown paper, which must be ascertained by trial. When once the red border has been detected, it becomes very conspicuous; the difficulty in the first instance being, not in seeing it, but in knowing that one sees it. The phenomenon is, no doubt, constantly met with, and habitually ignored, in daily life. The conclusion is that when a luminous image, not too bright, is suddenly formed upon the retina, it appears at first sight to be surrounded by a red border. Conversely, when a dark patch is suddenly formed upon a bright ground, the patch appears for a moment as surrounded externally by a blue border.

COMMUNICATED ARTICLE.

THE INFLUENCE OF WIND ON GASHOLDERS.

By M. Irminger, Engineer of the Copenhagen Gas-Works.

At the meeting of the Incorporated Gas Institute, in June, 1896, Mr. E. Lloyd Pease read a paper entitled "New Details in Gasholder Construction," in which he pointed out that during a heavy gale a wire-rope gasholder in Sligo had been provided with spiral-springs, attached to one of the ropes. This holder was 50 feet in diameter and 50 feet high, and had three lifts. The tension on the rope was measured; and the wind pressure was calculated to be about 2·6 lbs. per square foot. The author also mentioned an experiment made by me with a gasholder 120 feet in diameter and 24 feet high, which, during a heavy gale, was held by a rope $\frac{3}{8}$ inch in diameter for half an hour. The breaking strength of this rope was found to be 870 lbs., from which the wind pressure was calculated to be about 3 lbs. per square foot. Diagrams illustrating the pressure in a wire rope gasholder of the capacity of 2½ million cubic feet (184 feet in diameter) were produced; and the pressure showed, during a heavy gale, variations up to 4·5 tenth parts of an inch.

There can hardly be any doubt but that the wind pressure arrived at—viz., 3 lbs. per square foot—is approximately correct, though it certainly does not correspond with the pressures of from 20 to 30 lbs. that were considered to exist at Sligo on the above-mentioned day. These wind-pressures are, however, much contested; and the difficulty is that the wind continuously blows in gusts of very variable strength, which has been clearly proved (among others) by Professor Langley and Professor Marvin in America, and to which subject I shall return later on. A large surface is, therefore, not simultaneously on all its parts exposed to heavy gusts of wind.

Mr. J. Baier, of America, has examined the wind pressures exerted during a tornado in St. Louis on May 27, 1896. The results are shortly referred to in the "Journal of Gas Lighting" of March 30, 1897, wherein it is stated that large buildings were turned over by a pressure of 20 lbs. per square foot approximately; and, further, that the pressure destroying the St. Louis bridge had been from 50 to 64 lbs. The bearing-power of the wind that had carried away the upper structure had been 43 lbs. per square foot. If the terrible effects of such a tornado are taken into consideration, whereby more than 7000 buildings were more or less wrecked during half an hour, and the objects that were whirled about came down like projectiles, it will be found that the pressure which a gale here in Europe may exert is not in the same proportion. One may therefore assume that the pressure exerted on large surfaces must be considerably less than from 20 to 30 lbs., because, if this would not be the case, such destructions as are fortunately not known here would be the result.

I would recommend the reader to make a simple experiment, which I myself have tried, for finding the approximate pressure of the wind on a person during a heavy gale. A weight is attached to the end of a rope running over a pulley fixed at a distance of about 4 feet above the ground, while the other end of the rope is fastened round the chest of a man. The man walks forward; and in order that he may go some distance, it is advisable to make the weight moveable in a shaft or well. The experiment showed that a weight of 27 lbs. caused such a resistance that several men who tried the experiment, declared that they had never been out in a gale which had caused a greater resistance. With a weight of 55 lbs., it was almost impossible to move forward. It would be still more difficult to move along under constant variations of the wind-pressure. A full-grown man has a surface of about 7 square feet; and if 0·6 is assumed for the curving, the total effective surface will be 4·2 square feet. With a weight of 27 lbs., the pressure would be equivalent to 6·5 lbs. per square foot; and with a weight of 55 lbs., it would be equal to 12 lbs. per square foot. If on such a small surface the wind pressure is 6·5 lbs., per square foot, one may know from experience that the pressure will be smaller in proportion on such a large surface as a gasholder. Of course, I do not claim any great accuracy for the above-mentioned experiment; but one cannot help being astonished that such a pressure should cause so great a resistance against forward movement.

I have arrived at a similar result by another way; but as this is intimately connected with the oscillations of the gasholder in a gale, I will first say a few words on this subject. At the above-named meeting, the variations in pressures in the gasholder during the gale were pointed out, and several reasons were given to explain the circumstance. Among others, Mr. Pease alleged that I had found the wind lifted the holder and diminished the pressure. Having again been experimenting in this direction, I now wish to go further into the matter, because the results arrived at may be interesting on several points.

In 1894, I made a series of trials which have been published in abstracts of papers read before the Institution of Civil Engineers in 1894, and also in "Engineering" of Dec. 27, 1895. Among other things, I experimented with small gasholders. I found that such a holder, on its roof, was subject to a sucking-action in the straight upward direction, equivalent to about 0·43 multiplied by the normal wind pressure per square foot of the roof. The pressure on the side was equivalent to the area of the section multiplied by the normal pressure and 0·36 (of which 0·16 represents the pressure on the weather side, and 0·20 the sucking-action on the lee-side). In short cylindrical holders, with flat roofs—the diameter equal to the height—the coefficient for the pressure on the side was found to be 0·47; and for very long cylinders, 0·57. By suspending a small gasholder at the end of a lever, and letting an air-current blow over the roof, the holder was lifted; and the pressure inside the holder, which was lowered into water, was reduced in proportion to the wind pressure. That the results of these experiments may in a general way be considered as being correct, I have found by experiments carried out on a large scale. It is, however, of much greater importance that the results have also been confirmed by the above-mentioned Mr. Baier, who, in his treatise on the tornado at St. Louis, speaks minutely about these experiments, and concludes with the following statement: "The results of these experiments show that the wind acts in a direction quite different from that generally assumed and usually provided for in the designing of bridges, roofs, and buildings. The evidence at St. Louis confirms this conclusion."

The sucking-action takes place wherever the wind sweeps over a building; and if sufficiently strong, the wind lifts off the roof. This does not unfrequently happen, even in this country. With a gasholder, exactly the same thing occurs; and this is the reason why the pressure inside gets smaller whenever the wind blows on the holder. If the wind-pressure be assumed really to be (say) 30 lbs. per square foot, the lifting-effort, according to the experiments already referred to, would be $30 \times 0{\cdot}43 = 12{\cdot}9$ lbs. per square foot of surface of the roof, which would correspond to a water-column about 2·5 inches—of course, assuming that the total surface is subjected to the lifting-action mentioned above. Such a reduction of pressure, however, I do not think anybody has ever observed here, even in the strongest gale; and from this circumstance, I have drawn the conclusion that the wind-pressure on large surfaces is much smaller than is commonly assumed. This was the reason why I made the above-named experiments with a gasholder during a heavy gale, whereby I found that the pressure really was not more than about 3 lbs. per square foot on the total surface.

In order more closely to examine the sucking-action on the roof of a gasholder, I placed an automatic self-registering pressure-gauge on the outlet-pipe (36 inches) of a newly-built telescopic gasholder of a capacity of 2 million cubic feet (170 feet diameter by 90 feet high). During a heavy gale on March 30 last the pressure was observed. While the gale was blowing, the holder contained about 1½ million cubic feet of gas. The strength of the wind was very variable; and it blew now and then in heavy gusts. This was fortunate for the observation, because it resulted in very noticeable alterations in pressure. The result was that the bell, which during calm weather had a pressure of 6·25 inches, during the gusts of wind was lifted so much that the pressure went down to 5·83 inches. In a few seconds the pressure sank, simultaneously with the gusts of wind, and afterwards rose; but it did not reach 6·25 inches before the weather was calm again. It could be distinctly observed by the curve that the pressure rose as the gale dropped. For the rest, however, the pressure varied between 6·1 inches and 5·83 inches. The difference was $6{\cdot}25 - 5{\cdot}83 = 0{\cdot}42$, corresponding to 2·1 lbs. per square foot, or 44,000 lbs. for the total surface of the roof. Assuming my experiments to be correct, the normal pressure of the wind would be $2{\cdot}1 = 0{\cdot}43 \times P$, where $P = 4{\cdot}9$ lbs. per square foot during the most powerful gusts. This would show a somewhat greater pressure than has hitherto been found direct; and it may be that the greater height of the holder in this instance may have had some influence, as the speed of the wind increases upwards. The difference, however, may also be attributed to mistakes in the experiments and variable wind pressure. As already stated, the speed of the wind is very variable, and consequently also the pressure, which causes the gasholder to constantly swing up and down.

Professor Langley carried out experiments on elevated places clear of buildings and such like, with speeds of wind varying from about 9 to 36 miles. He used finely-registering instruments, showing the speed every second; and by this means he found that the speed of the wind changed every tenth second on an average, with a mean variation of 10 miles, but with innumerable smaller gusts which could not be registered. The variations would be from dead calm to 40 miles immediately afterwards. The curve, therefore, goes constantly up and down, and is very

similar to the diagrams showing the pressure for the gasholder. As, however, here the swinging periods are longer, on account of the mass that has to be moved, the smallest variations in the speed are not shown. On the day mentioned, it was several times observed that maximum reductions of pressure took place during a few seconds simultaneously with the heavy gusts of wind. The sudden reductions of pressure were even noticed at a distance of about 10,000 feet from the gas-works, as there are special return-pipes from the town which show the pressure at this distance on self-registering instruments. The pressure here fell during the heavy gusts of wind about 1-10th inch, before the regulator had time to even the pressure.

At the Meteorological Institute of Copenhagen, self-registering wind-measuring instruments are employed, about 70 feet above water-level. These instruments indicate the speed in metres per second, measured by a water-column (Hagemann's wind-measuring apparatus). The curves, as always, show sudden oscillations; and on the 30th of March, when I experimented with the gasholder, the diagrams were submitted to me. They showed that the maximum speed was 21·5 metres per second (47 miles per hour); but this occurred only with one gust of wind. At the time I observed the gasholder, there were a few gusts of wind of a speed of 20 metres (44 miles); and several reached 17 to 18 metres (37 to 40 miles) sinking rapidly down to from 8 to 9 metres (18 to 20 miles).

If calculations are carried out based on single gusts of wind of 20 metres (44 miles), the tables of the Institute will give a wind-pressure of 5·36 lbs. per square foot; and after Wipple and Dines's experiments, of 5·6 lbs. per square foot. As, however, one cannot assume that these gusts of wind have struck the whole of the surface simultaneously, a speed of 18 metres (40 miles) will probably be nearer the truth; and this would correspond to a pressure of 4·6 lbs. per square foot. If this result is compared with the 4·9 lbs. found by the pressure-measurer, it appears as if the latter figure was rather too high. I therefore think I am justified in drawing the conclusion that during the above-mentioned gales a maximum wind pressure of between 3 and 5 lbs. per square foot was exerted and distributed on the total surface; while at the same time the roof was subjected to a lifting-action up to 2 lbs. per square foot, corresponding to a maximum reduction of the gasholder pressure of about 0·4 inch. When the speed of the wind diminishes, variations of pressure also get smaller. The self-registering apparatus, also, in this instance shows an exact picture of the average wind pressure at each moment, which I have proved by a series of experiments carefully carried out.

A gasholder is sensitive even to smaller variations in the average speed of the wind, and affords therefore a good opportunity to judge of the average pressure on the total surface, which is the most interesting point. One may therefore calculate that a reduction of each 1-10th inch inside the holder will correspond to a lifting-action of about 0·5 lb. per square foot of the surface of the roof, or a normal wind pressure of about 1·2 lbs. per square foot. It is, of course, not my intention to recommend a weak structure of guides, but only to point out that the effect of the wind on gasholders under existing conditions of the climate here is probably considerably smaller than is generally supposed. This circumstance, however, does not do away with the fact—especially with gasholders where there is a large space for play between the rollers and guides—that strains may arise which would justify taking ample precautions as regards safety. This, of course, would be of less importance when the space for play is smaller—which it ought to be—and also from other reasons.

The weight of a gasholder is also an important factor, because the mass (inertia) in itself offers a resistance against movement that may be rather considerable with gusts of wind of short duration—and heavy gusts of wind are generally short. This resistance which is proportionate to the weight of the holder and inversely proportionate to the square of the time—is therefore of special effect against sudden gusts, which are the most dangerous. The wind pressure on the side of the holder, and the simultaneous lifting action, produce a resultant that is inclined, and assumes the direction of the wind, the consequence of which will be that the thrust on the guides gets weaker and more even than would have been the case if there had been no lifting action and the thrust had been vertical on the rails.

In order to examine these relations more closely, I think the best way would be to make experiments during a gale; and as a small contribution in this direction, I have given these results of my experience.

Calcium Carbide from Peat.—East Friesland, abuting on the North Sea, abounds in peat bogs. The beds of peat are in many parts 50 to 60 feet deep; but, owing to the low heating value of the peat, it has hitherto been found impossible to secure a market for it, in the face of the ample supplies of good coal from the not far distant Westphalian fields. The district is very sparsely inhabited, and is without any important industry. Dr. Frank suggests that the peat deposits should be utilized, on the spot, for the production of calcium carbide. There are large beds of limestone near Rheine on the Ems; and transport thence to the peat moors would be easy and cheap. It is estimated that 30 tons of the peat would furnish the electrical energy necessary for the production of 1 ton of calcium carbide.

TECHNICAL RECORD.

INSTITUTION OF CIVIL ENGINEERS.

The Annual General Meeting of the Institution was held on Tuesday last—Mr. J. Wolfe Barry, C.B., the President, in the chair.

The report of the Council for the past year was read by the Secretary. The most important matter which had occupied attention was the alteration of the bye-laws so as to supplement the existing regulations by the introduction of a test, by examination, of the general and scientific knowledge of candidates for election into the class of associate members. The proposals of the Council having been sanctioned by the general meeting held on the 30th of March, arrangements for giving effect to the new rules were under consideration, and would, it was expected, be settled shortly.* Other minor alterations had been made. With a view to promote the interests of many of the country members who were unable to attend the weekly meetings, arrangements have been made to hold a general conference of the Institution in London on the 25th, 26th, and 27th inst., which it is hoped will satisfy a need that has been felt in an increasing degree with the expansion of the Institution. Since the last annual meeting, Mr. James Forrest has retired from the post of Secretary, which he held for forty years, and has been appointed Honorary Secretary. An appreciation of Mr. Forrest's services, extracted from the President's inaugural address, was inserted in the report. Mr. Forrest has been succeeded in the Secretaryship by Dr. J. H. T. Tudsbery, who has for several years acted as his principal assistant. During the past year 2 honorary members, 37 members, 279 associate members, and 14 associates have been elected—being a total of 332; while by death, resignation, and erasure, 158 names disappeared from the register. The roll now numbers 6204, as against 6030 at the corresponding date last year. There are also 886 students attached to the Institution; so that the total number borne on the books on the 31st of March was 7090. The income was £22,285; and £15,417 has been received on capital account to meet the expenditure on the new building. Trust funds have realized £466. The expenditure has been £40,394, of which about one-half represents the normal expenses of the year; the balance being incurred principally in connection with the new building, while the expenditure on trust funds account has absorbed £468. The liability of the Institution to various taxes having been repeatedly questioned, the Council have taken legal advice upon the matter, and proposed to act thereon. The effect of the alteration initiated last year in the period of the session had been to make the meetings cover exactly six months from November to April both inclusive. During the past session twenty-two ordinary meetings were held, at which fifteen papers were read and discussed; the opening night being, as usual, devoted to the delivery of the President's address, and to the presentation of the medals and premiums.

The following preliminary report of the Committee appointed last year to consider and report upon the definition of a standard or standards of thermal efficiency for steam-engines has been adopted by the Council: "Your Committee beg leave to report that they have now practically come to an agreement on the subject of the reference to them; and that the draft report has been drawn up. It was hoped that this report would have been ready to submit to you in time for the annual meeting; but unforeseen delays have occurred. Your Committee, however, wish now to state that the gist of the conclusions they have come to is as follows: (1) That the statement of the economy of a steam-engine in terms of pounds of feed-water per I. HP. per hour is undesirable. (2) That, for all purposes except those of a scientific nature, it is desirable to state the economy of a steam-engine in terms of the thermal units required per I. HP. per hour (or per minute); and that if possible the thermal units required per brake HP. should also be given. (3) That for scientific purposes the thermal units that would be required by a perfect steam-engine working under the same conditions as the actual engine should also be stated. The proposed method of statement is applicable to engines using superheated steam as well as to those using saturated steam; and the objection to the use of pounds of feed-water, which contain more or less thermal units according to conditions, is obviated, while there is no more practical difficulty in obtaining the thermal units per I. HP. per hour than there is in arriving at the pounds of feed-water. For scientific purposes the difference in the thermal units per I. HP. required by the perfect steam-engine and by the actual engine shows the loss due to imperfections in the actual engine. A further great advantage of the proposal is that the ambiguous term 'efficiency' is not required. Your Committee will do themselves the honour of submitting their complete report at an early date."

The fifth "James Forrest" lecture was given on the 18th of March by Dr. G. Sims Woodhead, the subject being "Bacteriology," and aroused such interest that it was repeated on the 25th of March. Nine supplemental meetings for students had been held during the session; and six visits to engineering works had been made. The local associations of students at Manchester, Glasgow, Birmingham, Newcastle-on-Tyne, and Leeds, continued

* This matter was discussed in the "JOURNAL" last week, p. 929.

to do good work. The engineering conference, in which the students would be permitted to take part, would afford an opportunity for members of that class to assemble as usual in London in the month of May.

It was announced that the following gentlemen had been elected to form the Council for 1897-98: *President*, J. Wolfe Barry, C.B.; *Vice-Presidents*, W. H. Preece, C.B., Sir Douglas Fox, James Mansergh, and Sir William Anderson, K.C.B.; *Other Members of Council*.—Alex. R. Binnie, Henry Deane, W. R. Galbraith, George Graham, J. C. Hawkshaw, Charles Hawksley, John Hopkinson, jun., Alex. B. W. Kennedy, John Kennedy, George Fosbery Lyster, Sir Guilford L. Molesworth, K.C.I.E., Captain Sir Andrew Noble, K.C.B., B. B. Stoney, F. W. Webb, Sir William H. White, K.C.B., Sir E. Leader Williams, Horace Bell, T. Forster Brown, G. H. Hill, J. C. Inglis, and William Matthews.

AUTOMATIC GAS STATION GOVERNORS.

By Henry O'Connor.

[A Paper read before the Society of Engineers on Monday, May 3.]

Before describing minutely the more recent description of gas-governors in use, it may be well, in a Society like ours—composed as it is of members of all the various branches of the profession—to describe succinctly the duty which the gas-governor is called upon to perform in the ordinary way in a gas-works. Those who are members of the gas engineering profession, will perhaps pardon the elementary nature of the few remarks which follow.

It is not apparently known who was the first to invent the form of governor commonly in use. Clegg, the inventor of the wet meter, however, patented a form of gas-governor in 1815. The fact that this apparatus has remained in practically the same form since the earliest days of gas lighting, clearly shows it to have been an invention of the most complete nature, which should have been a feather in the cap of the engineer who designed it. It was quickly found that, when gas was stored in the gasholder (or gasometer), and allowed to flow directly therefrom into the town, the varying weight of the gasholders at different heights, due to their partial immersion in water, and the consequent difference between the weight and the specific gravity of the iron of which they were composed, caused a considerable difference in the pressure thrown upon the mains in the town or district supplied. Again, the pressure required during the day, when little or no gas was in use, was only small; but without a governor, it was impossible to alter the pressure from that thrown by the gasholder, except by means of the outlet-valve, which might have been partially closed, and thus only allowed a small quantity of gas to pass. But in this case, had a sudden demand for gas taken place, the valve only allowing a small quantity of gas to pass, would have prevented the extra quantity going out when required, and thus a reduced supply would have been available. To remedy this defect, the governor was invented; and it is required, as ordinarily constructed, to maintain automatically at the outlet of the works a constant pressure upon the outgoing gas, whatever the variations of the pressure may be in the inside of the works or that outside, resulting from the lighting or extinction of burners upon the system of mains. These variations of pressure actuate the movable cone or valve, and cause the apparatus to deliver the gas proportionally to the needs of consumption.

Again, if we consider the loss in the main, there is a great advantage in reducing the pressure to a minimum, because whenever the pressure in the mains is greater than is strictly necessary for the requirements of the consumers, there is loss to the gas supplier. It has been said that where the leaks occur in the ground, and through cracks in the mains, the loss does not increase as the square root of the pressure, as is the case with a leak from a round hole in the open, but directly as the pressure. When the pressure upon the outlet side falls, owing to an increased consumption, the valve is opened for just so long, and to such an extent, as will restore the pressure to that at which the governor is set. [The author showed a drawing of such a governor, wherein the gas enters and passes around a cone, through a hole in the seat, and away by the outlet.]

The weight of the bell of the governor is counterbalanced, either by weights pendant from a chain passing over a wheel or by means of floats in the bottom of the bell immersed in water, or by a combination of the two methods. The bell, therefore, being in equilibrium, the pressure of the gas has a natural tendency to cause the bell to rise; and weights have to be either put upon the bell, or taken off the counterbalance weights, to again bring the bell into equilibrium. The amount of weight regulating the pressure of the gas necessary to effect this, and thus regulating the pressure at which the gas shall pass away into the town mains, the calculation for the amount of weight necessary for ensuring the desired pressure is very simple. Yet the author has found many gas engineers who have not taken the trouble to inquire sufficiently into the question to thoroughly understand the laws governing it.

In the first place, the pressure of the gas is always spoken of as so many inches of water. Now, the weight of water is such that a column 27·63 inches in height is equal to a pressure of 1 lb. per square inch. Therefore the area of the top of the bell in square inches, divided by 27·63, equals the number of pounds weight necessary for 1 inch pressure. Let us suppose that it is desired to know the weight necessary to be placed upon a governor with a bell 18¾ inches in diameter, to cause an increase or decrease of 1 inch of pressure. We shall find that the area is roughly 2763 square inches, which, divided by 27·63, gives us 10 lbs. as the required weight. Or, in other words, 10 lbs. will cause a pressure upon the bell in the opposite direction to the pressure of gas, and to exactly the same amount as a pressure of 1 inch of water on the bell-top. Another method of arriving at the desired end is to find the area in square inches of the bell-top, and mutiply this by the weight of 1 cubic inch of water, which is 0·0361 lb. This will give the weight of a body of water covering the top of the bell and 1 inch deep. This will equal the weight necessary for 1 inch water pressure; and any other pressure can be determined by direct proportion—that is to say, 1-10th inch pressure will only require 1-10th of the weight so found, while 2 inches pressure will require double the weight, and so on. These are very simple rules; but they form the foundation upon which all the details of governors, and many other pieces of gas apparatus are constructed.

But to return to the description of the ordinary gas-governor. The gas, after it has passed the cone, is at liberty to press against the top of the bell; and it will then raise it, and with it the cone or valve which is fixed to it by a chain or rod, at the same time reducing the space between the cone-valve and its seat in direct proportion with the rise and fall of the bell. It is on this account that the cone is made of a parabolic curve instead of a straight cone; the parabolic shape being the result of the calculation of the necessary size of the cone at different points of its travel, to ensure even and exact reduction of the area of the gas passage-way between the top and bottom of the travel of the cone. It will be easily seen that, if the total diameter of the opening be in inches, the reduction of 1 inch in diameter, from 12 inches to 11 inches in diameter, will cause a greater reduction of area than when the reduction is made from, say, 6 inches to 5 inches in diameter. If, therefore, it is desired to divide the total height of a cone of, say, 18 inches depth so that at each 1½ inches from the bottom the sectional area is reduced by 1-12th, it will be found that the necessary diameters are (in inches): 12, 11·48, 10·99, 10·4, 9·8, 9·17, 8·5, 7·76, 6·92, 6·0, 4·9, 3·45, 0; and these, set out at the correct distances apart, will form a parabolic curve as above described. The author has here a model to illustrate this, which consists of discs of cardboard of the diameters above mentioned, fixed on a string at distances of 1½ inches apart; and a student may amuse himself by calculating the areas of each disc, when he will see that each is the same number of square inches less in area than the one preceding it. On opening the discs to their correct distances apart, it will be noticed that their edges form points in a parabolic curve; and by dividing still further, we can obtain, if necessary, more points in this curve, which will enable us to set it out with great exactness. When the gas in the main-pipes is being consumed rapidly, the pressure tends to fall, when the counterbalancing of the bell by the pressure of gas is reduced, with a consequent fall of the bell and an opening of the passage-way for the gas, which permits a greater volume to pass, until the balance of pressure is once more restored; and this goes on continuously—the cone-valve opening and closing as required.

The governor thus described is, as before stated, substantially the same as was designed in the earliest days of gas manufacture and supply; and since that time various slight modifications of this piece of apparatus have been devised, to overcome certain small defects which it has been found to contain. In the first place, the pressure of incoming gas upon the under side of the cone caused a variation in the outgoing quantity when anything occurred to alter the inlet-pressure. This defect was overcome in different ways. One was by making the gas passage-way in two, with separate cones, both depending from the same chain one above the other; but the gas, instead of passing the under side of the cone, is made to pass so that the upper cone has the pressure upon its under side—thus causing the cones to be in equilibrium, and removing any possibility of variation in the outlet-pressure due to the varying weights of gasholders, &c.

Another method of accomplishing this end, is to make the gas pass downwards past the cone, and at the same time press upwards against such portion of the top of the bell as will equal the area of the bottom of the cone; an inner chamber or bell being made, to the under side of which the inlet-pressure is brought—the remainder of the bell being subject in the usual way to the outlet pressure of the gas. One thing in this pattern governor which is usually taken advantage of, is that the connection from the gas-mains to the bell need only be very small, so that, should the bell by any means get canted and leak, the quantity of gas lost will be comparatively small. The connections, both on the inlet and outlet sides of the governor, are usually only wrought-iron tube of about ¾ inch diameter; while the old pattern governor was open to the full size of the connections, should the bell get displaced.

Now in all these forms of governor the pressure of the gas at the outlet to the town mains is decided upon by the engineer; and weights are either put on or taken off as the pressure is required to be greater or less. But should the weights be put on or removed too suddenly, the rapid change in pressure may cause the whole of the lights in a town to be extinguished; and to obviate this trouble, several methods have been suggested

and tried with success. One of these, the invention of Mr. W. Foulis, differs very considerably from the usual type of governor, inasmuch as the bell itself forms the cone or valve; and the whole being contained in a cast-iron case, the usual method of placing weights upon the bell cannot be adopted. A second bell is therefore placed in a separate tank, which may, if desired, be placed half a mile away, and is connected to the underside of the bell of the governor by a wrought-iron tube, so that the pressure on the underside of the governor-bell and that on the bell in the tank is the same. Consequently, any loading placed upon one bell, and causing increased pressure upon it, is at once communicated through the tube to the other bell. In this governor, this pressure is used to counteract the pressure of the gas upon the upper side of the coned bell; and thus the valve is kept in equilibrium. But further to keep the coned bell from responding instantaneously to the pressure on the under side, a plunger is connected to it in such a way that a liquid —usually glycerine—has to pass from the inside of the cylinders to the outside, either through the space around the plunger or through a very small hole provided in the upper end of the cylinder. Acting somewhat in the same way as the familiar anti-door-slammer, this forms a preventative to the too rapid opening or closing of the valve, and would have entirely prevented a recent trouble in the North of Ireland, where the fainting of a workman loading the governor-bell, caused him to fall upon the bell, and thus extinguish the lights of the town. If the governor now under notice had been in use, the only effect would have been that the lights would have probably flared up rather too high, owing to an increase of pressure. But it would have been so gradual as to have been hardly noticeable; while at the same time this governor is so sensitive that the mere weight of a coin will cause a difference in the pressure thrown by it. These actions of a plunger and cylinder have recently been adopted for a similar purpose on a governor for regulating the supply of steam to the engine driving the exhauster of a gas-works, so that the steam is automatically partially shut off when the supply of gas from the retort is somewhat reduced; the plunger system preventing the steam from being entirely closed off, if by any means the pressure should suddenly be lowered. A further method of loading to prevent sudden and jerky changes of pressure has been employed; and this has been by the use of water as the loading agent. This water can be gradually run in so that the increase of pressure is likewise gradual. The removal of the water is effected by means of syphons, which can be set to work at any speed, by means of taps which can be opened to just such an extent as is found most suitable.

Another method of obtaining an equilibrium gas-governor is to have the two cones, one inverted, fixed pendant one from each end of a balanced cross-bar. This is the patent of Messrs. Hawkyard and Braddock. The two cones balance themselves, and act in opposite directions in combination with the bell, which is fixed directly over one of the cones; the connection to the other one being carried down through a sealing-bell only, which is, of course, of small diameter. The weights are placed upon the larger or governing bell, so that should the pressure of gas on the outlet side be increased by any cause—such as diminished consumption—the large bell rises proportionally, and closes both cones by raising the one pendant from it and lowering the one pendant from the opposite end of the cross-bar. If, however, the pressure decreases on the outlet, and the bell falls and makes the space around the cones greater, it increases the quantity of gas passing to the outlet side, and thus raises the pressure and the bell. The connections from the cross-bar to the bell can be made adjustable, so that both cones can be opened and closed simultaneously. One peculiarity of this governor is that either end can be made the inlet; the only difference being that the pipe leading from the outlet side to the governing bell must be fixed so that it obtains its pressure from the issuing side of the apparatus. There is also no float required; and the balancing weights are of smaller size and weight than with the ordinary pattern governors.

A distinct departure from the ordinary pattern governor is made in one in which the suspended parabolic cone for opening and shutting the issuing orifice for the gas is entirely dispensed with, and a balanced throttle-valve is substituted, which is made to open and close by means of levers or radius arms placed inside the valve-chamber upon the disc. The advantage of this pattern governor is that the bell need only be of small area. It is the invention of Mr. Charles Hunt. It would appear, however, to the author, that this system has the objection that the opening for the passage of the gas does not increase in area strictly in accordance with the rise and fall of the pressure and in consequence of the bell; hence the same effect is caused as if the cone of an ordinary governor were made truly conical instead of parabolic.

Of all the various patterns suggested for the valve, other than the usual parabolic curve, it will be impossible to treat, as there are a large number only differing from each other in some slight degree. In one of these, the conical portion is restricted to the upper part only of the valve; the lower portion passing through a space fitting it fairly closely. This arrangement, which is the invention of Mr. J. Milne, removes the pressure from causing the bell to rise, as any increase in inlet-pressure rather causes a falling of the cone than otherwise, and thus allowing an extra quantity of gas to pass to the outlet side, immediately raises the valve, owing to the excess of pressure. A considerable number of valves are made of a conical chamber, somewhat like the one last mentioned, but with holes cut in the sides through which the gas has to pass; the height of this chamber above the seat regulating the quantity of gas passed. The exact shape and area of these holes are determined by calculation, so that the rate of increase of area in the gas-passage is exactly in proportion to the fall of the bell.

In order to avoid the heavy weight of the bell causing excessive friction upon the wheel over which the chain passes to the counterbalance weights, annular air-chambers are sometimes placed around the bell of the governor, which give the latter a buoyancy. These can be made of such size as to entirely dispense with the need of any counterbalance weights at all; and in these governors the pressures are increased by adding weights to the crown of the bell, instead of removing them from the counterbalance weights in the usual way—the contents of the air-chambers being, of course, sufficient to give buoyancy to the bell to keep it high enough, when no weights are on, so that the pendant cone is drawn up until the hole in which it works is entirely closed, even when no pressure of gas is presented to the under side of the bell. Combinations of the two systems have also been adopted, when the diameter of the governor has been preferred of such size as to prevent the use of an air-chamber of sufficient capacity to alone effect the desired pressure.

Easy working of the bell is necessary; and ball bearings have been employed to ensure this where considerable weight is required to counterbalance the bell. A large bell ensures a considerable difference in the pressure exerted to raise and lower it when only a slight difference of gas pressure is apparent. But at the same time the extra weight of the bell, and this larger pressure, require a greater amount of counterbalance weight, both of which necessitate a greater effort to overcome the *vis inertia*. Gas managers are very loth to recognize that it is not necessary to have the valve the full area of the pipes conveying the gas to and from a governor. The rate of passage of gas past a cone and through a circular opening has, perhaps, never been accurately worked out; but the author feels sure it would surprise many who have held strong opinions on the subject. Possibly the shape of the cone causes the gas to flow easily through the aperture; but more probably the principal cause is the very short distance which the gas has to traverse through the smaller area. It is well known to many that, when small mains are in use, and it is desired to make a connection for a side street of, perhaps, only a little smaller diameter than the original main, it is frequently the practice to tap a hole only some three-quarters the diameter of the connection proper, and to place a short length of tubing of the smaller size, and then, with a reducing socket, increase to the larger dimensions. It has been found, over and over again, that this has no effect whatever upon the output of the connection; the short distance of travel through the smaller diameter main amply compensating for the restricted area.

The pressure at any point of the district is equal to the pressure at the works, less that lost through leakage, and the gas consumed between that point and the works. Therefore, if it is required to maintain a uniform pressure at any point, it is necessary to make the outlet pressure at the works follow the same variation as the loss of pressure due to leakage and consumption. Pressure is also lost through friction against the sides of mains. With the ordinary governor, it is necessary to load it earlier and to a greater extent, and again reduce it at a later hour than is required by the consumption, owing to the need that the pressure must not be allowed to fall lower than has previously been found necessary. It will be noticed in all pressure-registers that the line rises as soon as the weights are put on, and then rapidly falls until the next weight is placed upon the bell.

The variations in such a climate as ours alter considerably the hours at which it is necessary to illuminate the houses and shops of our town, and in consequence the time of day when increased consumption requires an increase of pressure. No gas engineer can, therefore, decide absolutely beforehand at what hour the weights are really required to be placed upon the governor-bell, and must depend largely upon the good sense and carefulness of the attendant in whose charge the governor is placed. Provided this attendant is competent, and fulfils his duty conscientiously, a great deal has been done towards assuring a fairly even pressure throughout the district. But in many places the works are placed at a considerable distance from the town proper and the centre of consumption; and it may be still light at the works, while a dark fog is beginning to spread over the town, and the pressure is really wanted to be augmented. The attendant, however, knows nothing of this, and will not alter the pressure until the usual hour; and then it will be put on in such a way as to cause a slight but quite perceptible jump at the lights adjacent to the works.

It has been proposed—and such an apparatus is in use—that the pressure should be put on and taken off by means of water-loading through taps which are opened and shut by means of clockwork. This will certainly carry out the desire of the gas manager in regard to putting on and taking off the pressure at the pre-arranged hour; but it takes no notice of dull days, and consequently the earlier lighting up of the burners in the town. Everyone knows the difficulty encountered when it is required to suddenly, and only occasionally, look to a piece of apparatus which in general attends to itself; and it can easily be seen that

it could often be the case that the necessary pressure, when required at an earlier hour than usual, would not be put upon the district. Again, the delicacy and complication of the clock-work renders it somewhat doubtful that this is a satisfactory solution of the question.

The area of the trunk mains is often very much too small for the amount of gas which has to pass through them; rendering a larger pressure necessary to force the required quantity through them. This has a distinct effect upon the pressure at which the gas must be supplied at the works; and in designing any automatic system, this must be taken into consideration. There is no doubt that what is required is an equal and regular pressure at the service-pipes of all the consumers in the district; and if this cannot be obtained in its entirety, a near approach to it will be better than the present system of giving a high-pressure at the works to enable the consumer at a distance to obtain a fair pressure, even when the demand for gas nearer the works is very large. This is well so long as the demand remains large; but if it diminishes, the pressure, both at the consumers' premises at a distance and at those nearer the works to a greater extent, becomes excessive. This question, which some time back appeared inevitable, was allowed to lie neglected, as no way out seemed possible, unless a man with brains were in attendance, to alter the pressure as the demand increased or diminished.

Again, in days gone by the demand during the day was very small; and the gas manager could safely lower the day pressure to 10-10ths without much fear of having complaints that some customers could get no gas. Consumers now use considerably more gas during the day for sundry purposes—such as for cooking-stoves and gas-engines, both of which require a fair amount of pressure for satisfactory working—and they are more exacting in their demands. The question of economically satisfying these demands is therefore acquiring greater importance day by day. Excessive pressure in the street-mains increases the leakage; but insufficient pressure not only calls down complaints, but reduces the consumption. Vague and irregular pressures are not only the worst, but also the commonest of distribution evils; and though the gas manager does not always hear them, they exercise a bad effect on the bulk of the consumers. One of the principal causes of these irregular pressures is the custom of putting on a regular pressure at the works between certain hours of the evening, when presumably gas is most needed. But the quantity required is continually varying, as anyone who has watched the rate of travel of a station meter will readily own. Again, the custom is very usual of giving the same maximum pressure for a certain period during the summer as is given during the winter quarter; while the consumption per unit of time is far less than in the latter case.

The dream of the gas manager is probably the supply to each consumer throughout his district of a gas of equal illuminating power to that sent out from the works, and delivered at the consumer's burners at an equal pressure throughout the district which his mains traverse. That this is likely to remain in its entirety but a dream is, the author fears, but too probable. The difference of temperature and barometric pressure, varying so much as it does throughout the districts supplied in many cases from a single works, where the levels may differ considerably, will alone account for a considerable variation in the pressure; while the friction in the mains will be responsible for a further alteration. Much has been done by Peebles, Sugg, and others in supplying, for the use of the consumer, small governors or regulators, which enable him to reduce the pressure at which the gas is consumed at the burner to the limits within which it has been found most economical to use the gas. But, alas! the consumer is not easily trained to recognize the advantages to be thus obtained. He is very liable to think more of the initial cost of these regulators than of the undoubted saving which is obtainable when they are used; while the burner hawker, with his plausible tales and cheap burners, is ever among the customers, and pouring into their ears the very doubtful advantages of his wares. Unfortunately for the gas manager, the consumer is accustomed to blame the gas company for every deficiency in light which he detects in his own burner; and is very chary of accepting any advice from a man whom he wrongly considers to be his enemy—namely, the gas manager. If he can only be brought to understand that it is to the gas manager's interest for him to burn his gas to the best advantage, and to be satisfied with the light he is obtaining, the gas manager's life would indeed be a happy one. But as this is not the case, it behoves the manager to do all in his power to supply to the consumer the gas at such a pressure as will suit the majority of the burners used throughout the country. Hence the great necessity of adopting any form of governor in the works which will so regulate the supply that the pressures at any part of the town are uniform, not only from day to day, but also at the same hour on each day. This can only be done when the works governor is controlled automatically in such a way that the pressure is in accordance with the size of the mains and the output at the moment of gas.

Such an apparatus has recently been invented by Mr. James Milne and the author, who proposes to describe some of the various methods by which this automatic loading and regulating of the bell may be carried out. Perhaps the more easily understood arrangement is that in which a quantity of water is made to pass by automatically-acting syphons into a chamber attached to the bell, in such amounts as will cause the weight upon the bell and the necessary pressure of gas on the outlet of the governor required to counteract this loading, to increase in direct proportion to the output of gas at the moment. In the ordinary cone governor, as already described, this output is made to increase proportionally according to the height of the cone with regard to its seat. Consequently the lowering of the cone, and with it the bell of the governor may be utilized to give the necessary indication of the quantity of weight required to give such pressure as may have been previously determined on; and by means of these self-acting syphons, the fall of the bell causes a flow of water from the tank to the chamber, directly proportionate to the height of the bell, and upon the rise of the bell, when the consumption decreases, the water in the chamber returns by the syphon-tubes back into the tank in like proportion.

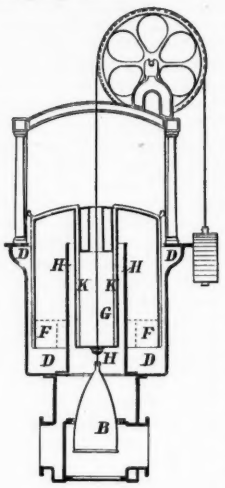


FIG. 1.

Fig. 1 represents the controlling arrangement, invented by Mr. James Milne and the author. The bell of the governor rises and falls according to the outlet pressure; and to it is connected, by a chain, the valve or cone B, which regulates the flow of gas. The tank of the governor is made in a concentric form; water being in the outer portion only, marked D. Ordinary weights are used to counterbalance the bell. G is a water chamber fixed to, and forming part of, the bell—consequently rising and falling in and out of the chamber H. K are two syphon tubes passing from the bottom of the water chamber G over the top of the bell to the bottom of the same on the outside. As the bell falls, due to increased consumption, the water from the tank passes through the syphons into the water chamber in such quantities as to keep the surface of the water of the tank D and that in the chamber G at the same level. Thus the lower the bell falls, the greater the quantity of water in the chamber G, and consequently the greater the weight of the bell, which is so proportioned as to occasion the desired greater pressure of gas to counterbalance it.

It will thus be easily understood how this arrangement will modify the pressures; but before touching more particularly upon the effects this has upon the pressures in the district, it may be well to mention one or two other methods by which the same object is achieved. Instead of the water being used for the purpose of loading the bell, a helix (or, if preferred, a pair) may be so fastened upon a shaft which also carries the wheel over which the counterbalance weight is suspended, that when a weight is fixed pendant from the helix the varying distances from the centre at which this weight will hang may be made to put more or less weight upon the bell as it rises and falls.

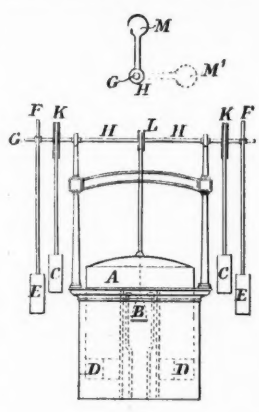


FIG. 2.

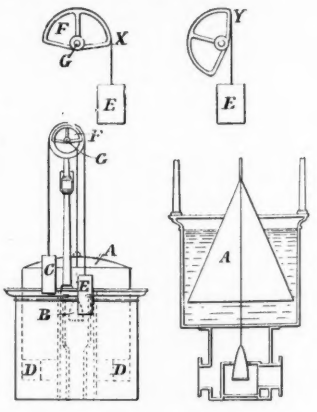


FIG. 3.

This arrangement, which is the invention of Mr. Milne, is shown in fig. 2. A represents the ordinary bell with the cone B fixed to it. C represents the ordinary weights used to counterbalance the bell; F the helix, and E the weight pendant from it. G the centre of the shaft H. When the weight E is suspended from a point in the circumference of the helix F at its greatest distance from the centre G (as X) it is neutralizing to a much greater extent the effect of the counterbalance weights C than when suspended from a point (Y) in the circumference of the helix F at its least distance from the centre G. Thus the varying distances of the points of suspension of the weight E from the centre G regulate accordingly the outlet pressure of the gas.

Another plan is to make the balance-weight chain with links of certain weights, so that the portion of the chain on the counterbalance weight side of the pulley is proportionately

diminished, and the weight upon the other side increased to the same extent when the bell falls—thus putting increased weight upon the bell. A heavy arm, with the weight at the end, will also serve to replace the helix. This, when standing in a vertical position, will exercise no influence; but as the bell falls, it will be carried to the side of the centre of the shaft, and partially counterbalance the balance-weight. A further method is to make the bell of the governor A taper upward, as shown in fig. 3, instead of having parallel sides, so that the further the bell is immersed in the sealing liquid, the smaller is the area of the bell at the surface of the liquid exposed to the pressure of the gas—occasioning a larger pressure of gas to counterbalance it. This is also the invention of Mr. Milne.

In all of these methods, it is necessary to note the position of the bell and cone when the maximum quantity of gas is passing through the governor at the maximum pressure found desirable, and also when the minimum quantity at the minimum pressure is passing. The distance of travel of the bell between these two extremes, and the radius of the helix and of the arm, the weight of the links of the chain, or the degree of taper or slope of the sides of the cone, will govern the rate of increase of pressure thrown by the governor. With either of these governors, the pressure is automatically changed entirely in accordance with the output of gas; so that the pressures are changed as and when required, and not when it is thought that they may be needed. The alterations of pressure are made so gradually that the line traced on a recording pressure-gauge fixed quite close to the outlet of the governor will show, not, as is usually the case when the weights are put on by hand, a series of steps which fall before the next rise occurs, but a gradual sloping line until the highest pressure is attained at the moment of the maximum output; and thereafter falling equally gradually until the minimum output is reached. The line practically never remains horizontal, unless the output of gas continues exactly even, which in most gas-works is never the case.

The advantages of such an automatic arrangement are so numerous that it is hardly necessary to dwell upon them. The avoidance of all possibility of jumping the lights in the district, of reducing the pressure when the output is at its smallest without endangering the power of supply at the right pressure, should such increased output be required, and the fact that the intelligence, or otherwise, of a man who probably has other duties to perform which may prevent him using what intelligence he may have at the right moment, must greatly weigh in favour of such an arrangement. In many districts, the leakage account might be considerably reduced were such a piece of apparatus in use. [The author exhibited diagrams which indicated the difference in the pressures thrown upon a district where such a governor is used, and where a further modification of this principle is in use.] If it be decided that the maximum pressure upon the district shall not exceed a certain amount, nor the minimum be allowed to be less than another certain pressure, the helix, water-chamber, conical bell, or other governing arrangement, can be made so that, even should the output be increased much above what is anticipated, the pressure does not rise above the maximum pressure for which it is designed; and the same when the minimum output is reached. This, then, may show on the diagram a straight line during certain hours of the day and for a short period in the evening at the time when most of the lights are on. A further use to which such a piece of apparatus might be put is for registering, with some slight degree of accuracy, the consumption or output of gas. As the pressure changes with the output, so by a system of calculation the quantity of gas passing the orifice around the conical valve might be determined; and this, once found, would remain constant.

Where two gases of different qualities are made in a works, and are mixed at an early stage in the process of manufacture, this system might easily be adopted for gaining some insight into the proportionate quantities of either which are being delivered into the apparatus for purification of the combined products. Of course, it is not intended to suggest that this would give an indication to anything like so fine a degree as would be the case if a station meter were used for the same purpose. But there are many situations in which this apparatus might be fixed, where a station meter would be impossible; and the cost of such a means of measuring the output would be distinctly less than that of a meter where considerable quantities had to be dealt with. An idea at one time occurred to the author to make the revolutions of the station meter govern the pressure of the outgoing gas. But the low rate of travel necessary in the ordinary station meter prevented a satisfactory adaptation of this idea; and the author was thus led to examine the means by which the governor can be made to regulate the pressures by itself.

Before such an automatic apparatus as either of the last three which have been described could be put to work in a satisfactory manner upon any district, it would be necessary to make a series of tests of the pressures in various parts of the district, and also to examine carefully the capacity of the various pipes supplying the district, so that the point of minimum pressure might be previously determined. It would also be necessary to so regulate the pressures that the supply at that point would be at all times sufficient for the consumers, despite any calls which the mains between that point and the works might be required to supply. The author regrets that, owing to the death of a well-known Gas Engineer (Mr. Linton), the series of experiments intended to have been carried out during the recent winter have had to be postponed, which would otherwise have conclusively proved the advantages of this system when supplying a large district served by three distinct trunk mains worked by three governors, all fitted with this apparatus at one centre. Sufficient, however, has probably been said upon the subject to enable those interested in this important question to examine into the merits, or otherwise, of the system; and it is hoped that any of those present who may have opinions either opposed to or in favour of the arrangement here shown, will state their views, so that if possible a further improvement may be made, and the general work of the gas engineer rendered a little less arduous and worrying than it is at present.

A New Gas-Engine Cycle.—For some time past, a member of the "Electrician" staff, Mr. Tremlett Carter, has (says our contemporary) been working out the details of a new gas-engine cycle, which he has invented, and which is designed to effect improvements where the Otto cycle is principally defective. These developments were completed some two months ago, and were then protected by patents; it being intended to acquire further foreign patents immediately. The principal improvements in the Otto cycle which this new cycle is directed to effect are: 1st, the useful recovery of heat wasted in the jacket and exhaust, which in the Otto cycle is represented by some 70 to 80 per cent. of the total heat; 2nd, the abolition of the idle revolution, without the use of two working cylinder ends, and without the use of a pump for compressing the explosive mixture; 3rd, an increase in the power obtained from a given-sized cylinder; 4th, the prompt and efficient regulation without omission of explosions; and 5th, a means of increasing the power of the engine considerably beyond the normal, to enable it to take extra heavy loads for short intervals. The consumption of gas by an engine working on the new cycle is expected to be 50 to 60 per cent. only of one with the Otto cycle.

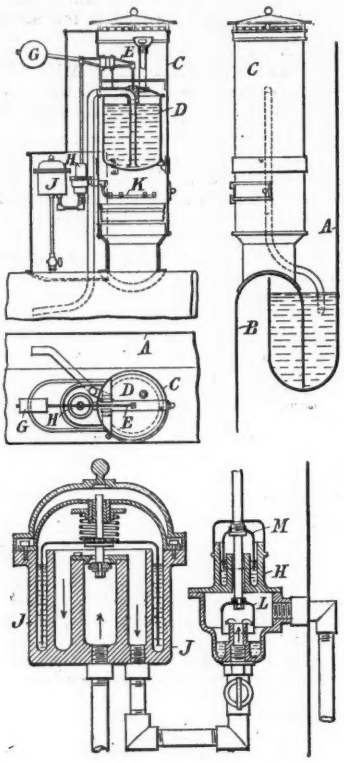
Institution of Gas Engineers.—In the course of the seventh annual report to be submitted by the Council at the meeting of the Institution which commences to-morrow, the deaths are announced as having taken place during the past year, of four members: Mr. F. T. C. Linton, of Edinburgh; Mr. R. V. Milne, of Birmingham; Mr. O. Pihl, of Christiania; and Mr. R. Smith, of Leeds. Mr. Linton, it is pointed out, was an original member of the Institution, and took a deep interest in its formation and progress. The Committee appointed last year to consider the questions of "Standards of Light," and "Correction of Gas for Temperature," have not yet concluded their labours; but a statement of their progress will be made at the forthcoming meeting. The Council are able again to announce a continuance of usefulness and an increase of membership, which are satisfactory indications of the prosperity of the Institution, formed as it is "to draw together for mutual intercourse and the exchange of ideas, all gas managers, whether of the largest or smallest works, as well as others holding responsible positions therein." The success of the autumn meeting (in Glasgow) again showed the appreciation in which these gatherings are held; and that they are of influence in broadening the knowledge which the inspection of typical works in various parts of the country affords, is confirmed by the interest evinced in the visit paid to the important undertaking of the Glasgow Corporation.

The Application of Extreme Cold to Purposes of Analysis.—The first of a course of lectures on "Liquid Air as an Agent of Research" was delivered last Thursday by Professor Dewar at the Royal Institution. The lecturer pointed out that the desire was very generally felt among scientists to investigate the conditions of gases at all temperatures, and thus carry on the work of Faraday, Regnault, and Dr. Andrews, of Belfast. The laws of Boyle and Charles, connecting together the volume, pressure, and temperature of a gas, broke down as the liquid state was reached, and indeed before; and for them Van der Waals, when working on the careful measurements made by Andrews, proposed a new formula which connected the gaseous and liquid states. From this it was possible to calculate the critical temperature of a gas, above which no amount of pressure could liquefy it; and the work of Cailletet and others consisted in the experimental verification of results thus obtained. Van der Waals also predicted that there would be found one isothermal line which would express the pressure, temperature, and volume relations of all gases; and Amagat's work had confirmed this prediction. Referring to the difficulty of getting to very low temperatures, the lecturer said that if liquid hydrogen were produced to-morrow, we should still be a long way from the zero of absolute temperature, and should have no conceivable way of reaching it. No liquefied gas could be utilized to produce a fall of temperature more than one-third to one-half its absolute critical range. Hence the lowest temperature that could be obtained by means of liquid hydrogen would still leave us some 20° above the absolute zero. In the course of the experiments which occupied the rest of the lecture, Professor Dewar illustrated the application of extreme cold to the purposes of analysis, by showing how with its aid certain constituents—such as ethylene and marsh gas—could be separated out in the liquid form from a mixture like coal gas. He also showed the extreme contraction produced by cold in gaseous and other bodies by cooling one end of a tube full of ethylene, the other end being immersed in mercury.

REGISTER OF PATENTS.

Preventing the Freezing of Telescopic Gasholders.—Livesey, F., of Old Kent Road, S.E., and Sugg, W. T., of Regency Street, Westminster. No. 8502; April 22, 1896.

This appliance for preventing the freezing of the seal water of the lifts of telescopic gasholders, consists in an automatic arrangement of apparatus in which water is boiled, and from which the boiling water is injected into the seal water.



In the illustrations, A is the upper lift of a gasholder, the lower curled edge of which forms the seal-cup in the usual way. B is the lower lift, the top curled edge of which forms the dipping-flange in the usual way. C is a casing which contains the apparatus the subject matter of the invention, secured at the bend of the lower lift. It is provided at the top with a removable ventilating cover. D is a boiler, preferably suspended from one arm of a beam E, having its fulcrum in bearings attached to the casing. The other end of the beam carries a weight G, and is connected to the cut-off, as will be explained. The boiler is provided with a filling-pipe, and also with a syphon-pipe, the long arm of which extends down into the seal-cup. The pipe moves with the boiler. H is the gas cut-off valve, operated by the weight G through the beam E, with which the valve is connected by a rod or stem. J is a governor; and K, a burner.

The cut-off apparatus (shown to a larger scale) consists of a bell L, dipping into an annular mercury seal around the gas-inlet pipe; but when the bell is raised out of the mercury, there is a free way for the gas to the outlet. To avoid the use of a stuffing-box to prevent the escape of gas, the stem carrying the bell L is provided with a second bell M and mercury seal, as shown. The governor J is of the ordinary mercurial form; the requirement being that it will reduce the pressure of the gas from 8 or 10 inches in the holder, to about 1 inch at the burner K.

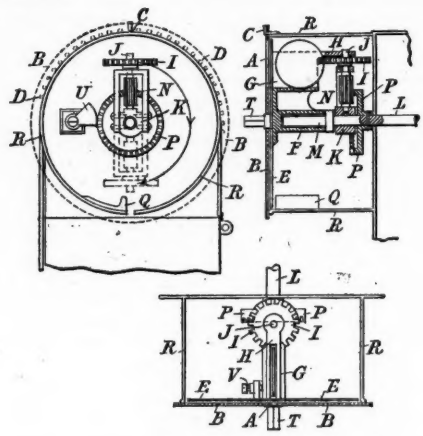
When working, the boiler is filled (through a funnel) with water, which overcomes the weight or the tension of the governor spring, and opens the main gas supply. The gas is then lighted, and, playing on the bottom of the boiler, causes a pressure of steam. When this pressure is increased to a certain limit, the syphon is set going; and the bulk of the boiling water, with some of the steam, is discharged into the gutter of the holder. The weight of the boiler being now reduced, it rises under the influence of the weight or spring; and the main gas supply is entirely cut off. The free steam in the boiler then condenses more or less rapidly, producing a vacuum in the boiler; and there being now no resistance, the pressure of the atmosphere forces a fresh supply of water from the gutter into the boiler, to fill up the vacuum produced. The weight of the water in the boiler then overcomes the counterweight or the tension of the spring, causes the boiler to descend, and opens the gas-valve; so that a full supply of gas passes to the burner, which immediately lights up from the pilot, and the operation goes on as before—boiling, discharging, and refilling.

Gas-Engines.—Binns, J. P. & H. G., of Luddenden, Lancs. No. 10,307; May 14, 1896.

These improvements consist: First, in clearing the explosive charge out of the compression chamber of a gas or oil engine by forming a slot or opening in the piston rod, which, by means of a spiral spring, causes the piston to advance into the compression chamber so as to force out the exploded charge. Secondly, in order to prevent explosions in the exhaust-pipes and boxes of gas and oil engines, the patentees apply an air-valve to the exhaust-pipe, so that, by means of the velocity of the exhaust vapour, a sufficient quantity of air will get into the exhausted charge to prevent an explosion. Thirdly, for the purpose of keeping the ignition tube and vaporizer apparatus hot with regard to oil-engines, it is proposed to use an air-tight tank, together with an air-pump, for forcing the oil into the vaporizer, at a regular pressure, so as to obtain a uniform and steady flame.

Coin-Freed Gas-Meters.—Glover, R. T. & J. G., of St. John Street, Clerkenwell. No. 11,696; May 29, 1896.

This invention in coin-freed meters is such that the operative parts can be adjusted to deliver any desired fractional quantity of a cubic foot of gas, after the insertion of a coin and moving a handle or lever by a consumer; the principal object aimed at being to ensure that the notches and the notched wheel or plate into which the coin drops can be so regulated in its movement as to impart only desired fractional movement to the mechanism that operates the supply-valve. The point of discharge of the coin is fixed, and not variable, as in the same inventors' patent No. 16,271 of 1895.



The coin-slot A is in the front plate B; this being adjustable on the stop C by moving and hanging the plate from any of the holes D, according to the quantity of gas to be delivered for the coin determined upon. E is a shield on the boss F of the coin-receiving pocket G, to close the slot except when the pocket is in the proper position for a coin to be passed into it. The pocket is an extension of the boss F; and from this extension is an arm H, in which a notched or toothed wheel I is pivoted. The axle J of the wheel I is stepped into a loosely fitted collar K of a frame at its lower end, so that the collar has free motion on the shaft L, the front end M of which is supported by the boss F, but otherwise is free for independent rotation. The axle has a pinion N on it in gear with the crown-wheel P, which is fixed on the shaft L, and by which the valve of the meter is opened through internal gear. Q is a fixed stop of the casing R, against which the coin impinges for it to drop freely from the pocket when turned or brought round by an exposed lever or handle fixed on the square end T of the boss F; the delivery of the coin from the pocket G into the money-till being always from the same spot. U is a drop cam for bearing against the periphery of the toothed crown-wheel P, to prevent "back rotation," and as a means of fixing the wheel except for rotation by a coin engaged in a notch of the wheel I when the outside handle is turned.

The action of the meter is such that, when a coin is inserted into the pocket, it rests in one of the notches of the plate, and prevents it from turning upon its own axis when the handle is turned by the consumer; but, by being in gear with the crown or spur wheel, it turns the spindle operating the valve to which the wheel is fixed. When the coin is discharged by gravity into the till, the coin-pocket is turned back, and causes the notched plate to travel over the teeth of the crown or spur wheel, and freely rotate on its own axis until it abuts against the stop, when one of the notches will be opposite the adjustable coin-slot for the reception of another coin.

The adjustable stop V is fixed on the inside of the price-changer plate, and is used to obtain the required fractional quantity of a cubic foot of gas; the units being obtained by altering the position of the price-changer plate B. For instance, if the notches in the wheel I are so multiplied by the gear of the pinion N in the crown-wheel P as to represent (say) one-tenth of a cubic foot, then it follows after the price-changer plate has been set to give the required units, the stop V can be so adjusted as to give any number of tenths of a cubic foot, and at the same time ensure that any given notch is in register with the coin-pocket for the reception of a coin.

Automatically Lighting Gas-Burners.—Borchardt, H., of Berlin. No. 2288; Jan. 28, 1897.

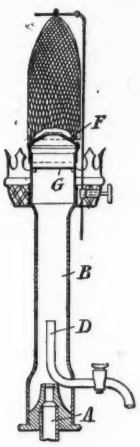
In allusion to his proposal, the patentee remarks that automatic lighting devices, more particularly for incandescent gas-burners, have before been suggested; and the following is the principle upon which they are based: An additional or secondary jet, ignited by means of platinum sponge, is employed to heat a body which, by expanding, opens the pipe by which the main burner is fed with gas; so that the gas issuing from the pipe in its turn becomes ignited by contact with the secondary flame. Then, the further expansion of the body referred to has the effect of cutting off the supply to the secondary flame, after which the main flame alone remains burning. Devices of this class, as hitherto constructed, are attended with the drawback that the mechanism which serves to turn on or off the gas supply is of extremely delicate construction, and liable to get out of working order through becoming obstructed by dust or other impurities. Besides, the body which is to be expanded by heat must of necessity be adjusted with perfect precision—"a requirement which none of the lighting devices that have up to the present time been introduced meet in anything like a complete manner." The automatic lighting device now proposed as a remedy for the first of the inconveniences

mentioned, consists in the fact that the mechanism for turning the gas-valve on or off is located within the gas-piping, and consequently is protected from injurious external influences; while the last-mentioned defect is obviated by arranging the part carrying the body to be expanded—not, as before, immovably fixed in position, but loose within a sleeve or socket, and supported upon a set-screw which may be raised or lowered, and the carrier consequently adjusted as desired.

Incandescent Gas-Burners.—Nagel, A., of Baden-Baden, Germany. No. 1860; Jan. 23, 1897.

This invention relates to an incandescent gas-burner arrangement which does not require a chimney to produce its best effect, but needs a supply of air under pressure.

The gas (supplied in the ordinary manner from below, by means of a pipe A) rises upwards in the vertical pipe B; and, on being lighted as it leaves this vertical pipe, causes the mantle to become incandescent. The air under pressure (produced by a water motor, fan, electrical power, or in other suitable manner) is supplied to the burner through a small pipe, which runs along the gas-pipe. Close to the place where it enters the burner, the gas supply, and also the supply of air under pressure, may be regulated by means of a common tap, or by two separate taps connected to work together. Behind the tap, the pipe D for the air under



pressure is arranged at the side as high as the burner, and turned towards it. The part of the vertical pipe from the point where the air under pressure enters up to the outermost wire netting F, is of special importance; and care must be taken in the construction of the burners to have this part of the right dimensions. If the burner be made shorter, there will be too little air; more gas will be needed; and the process of combustion will not proceed noiselessly. At the top of the pipe, and carried up higher, are two fine wire networks or sieves—one F lies directly under the surface of the burner cap or head, while the other G lies about a centimetre lower down. These are said to produce "a steady light and a noiseless combustion."

APPLICATIONS FOR LETTERS PATENT.

9838.—Slingsby, W., "Gas and oil motor engines." April 20.
9857.—Hutton, E. K. & W., "Acetylene gas generator for lighting cycle and carriage lamps." April 20.
9905.—Smith, S. G., "Gas generating and utilizing furnaces." April 20.
9912.—Bickford, J. S. V., "Atmospheric burners for combustible vapours." April 20.
9928.—Crastin, C., and Baldwin, G., "Acetylene gas generator." April 20.
9929.—Buck, G., and Torrey, E. S., "Carburetting air." April 20.
9933.—Exley, J. H., "Indicator for acetylene generators." April 21.
9940.—Lery, J. B. de, "Incandescent gas-lamps." April 21.
9968.—Kerridge, J. H., "Electric control of gas." April 21.
10,005.—Fritscher, A., and Houdry, A. R., "Gas or hydrocarbon motors." April 21.
10,022.—Wallace, G., "Gas and other stoves." April 22.
10,030.—Brindley, J. E., "Preventing the bursting of pipes and other fluid containers by freezing." April 22.
10,038.—Smith, F. H., "Acetylene or ordinary gas lighting for cycles and the like." April 22.
10,097.—Henriod, C. E., "Internal combustion engines." April 22.
10,103.—Rosenberg, J. M. M., "Production of acetylene gas." April 22.
10,136.—Hutchinson, W., "An ignition tube and connection therewith for incandescence gas-burners." April 23.
10,186.—Morency, D. C., "Apparatus for generating acetylene gas." April 23.
10,187.—Sheldrake, J. H., and Tourtel, J., "Automatic apparatus for cutting off a supply of gas, water, or electricity." April 23.
10,194.—Julier, C., "Gas-shade attachments." April 23.
10,199.—Thompson, W. P., "Apparatus for developing acetylene gas." A communication from the Deutsche Acetylengas-Gesellschaft mit beschränkter Haftung. April 23.
10,210.—Melhuish, A. G., "Internal combustion engines." April 24.
10,221.—Whimster, J., "Hydraulic anti-dip for gas-works and the like." April 24.
10,226.—Crowe, R., and Tee, H., "Incandescent gas lamps or burners." April 24.
10,249.—Thompson, W. P., "Production and consumption of acetylene gas." A communication from the Deutsche Acetylengas-Gesellschaft mit beschränkter Haftung. April 24.
10,260.—Boult, A. J., "Explosion engines." A communication from A. Lefebvre. April 24.
10,268.—Holmes, E. D., "Gas-washing apparatus." April 24.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The following progress was made with Private Bills last week:—

Bills (from the House of Lords) read a second time and committed: Cowes Gas Bill, Torquay Corporation Water Bill, Tynemouth Gas Bill.

Bills read the third time, and passed: Arundel Gas Bill, Devonport Water Bill, Luton Water Bill, Tuxford and District Gas Bill.

A petition to allow the introduction of a Bill, entitled the Cirencester Water Bill, was presented and referred to the Select Committee on Standing Orders.

THE WATER SUPPLY OF THE METROPOLIS.

The London Water Companies Amalgamation Bill was down for second reading last Wednesday, but was adjourned (without debate) till Friday, the 28th inst.

Petitions against the Southwark and Vauxhall Water Bill were presented from: 1. Vestry of St. Mary, Battersea. 2. Lambeth Water Company. 3. Kingston-upon-Thames Corporation and other local authorities. 4. Corporation of London. 5. East London Water Company. 6. Grand Junction Water Company. 7. West Middlesex Water Company. 8. Middlesex County Council. 9. London County Council.

Mr. Woods gave notice to move, in respect to the East London Water Bill—"That it be an instruction to the Committee to insert a clause compelling the Company to treat the ratepayers outside the Metropolitan area similarly to those within that area in regard to a constant supply of water."

Three questions were asked in the House last Thursday dealing with different phases of the London Water Supply.

Mr. Cohen asked the President of the Local Government Board whether he could state to the House the names of the members who would form the Royal Commission on the Water Supply of London.

Mr. Whitmore asked a similar question, and when it was intended to introduce the Bill for strengthening and improving the position of water consumers in the Metropolis.

Mr. Chaplin said: The names of the members of the Royal Commission on the Water Supply of London are as follows: The Right Hon. Lord Llandaff, Chairman, the Right Hon. J. W. Mellor, M.P., Sir John Dorington, M.P., Sir G. B. Bruce, C.E., Major-General A. de Courcy Scott, R.E., Mr. A. de Bock Porter, C.B., Mr. H. W. Cripps, Q.C., Mr. Robert Lewis. I may add, with reference to the question of my hon. friend the member for Chelsea (Mr. Whitmore), that I hope to bring in a Bill dealing with the water question as soon as I see any prospect of making progress with the measure.

Mr. Woods subsequently asked the President of the Local Government Board whether he was aware that the East London Water Company had introduced a new condition in their latest demand notes—viz., that it will be unlawful to use water in the future for gardens except through meters; whether in his promised measure he would make provision protecting the consumers against this prohibition of the use of water in gardens; and if he was aware that the Company in question had admitted that no reliable water-meter had yet been invented.

Mr. Chaplin: I am informed by the Company that, owing to the excessive use and waste of water by reason of garden-hose and other apparatus being employed, and frequently left running day and night, the Directors have given notice for determining the arrangements entered into for garden supply. The fixed charge has been abolished; and the supply for garden purposes will be furnished through meters. I must defer any statement as to the provisions of the proposed measure until it is introduced by me. As regards the last part of the question, the Company state that they are not aware that they have ever "admitted that no reliable water-meter has yet been invented." They also state that it is physically impossible for more water to be registered than passes through the meter; though it may happen that the whole of the water passing through the meter is not registered.

HOUSE OF COMMONS COMMITTEE.

Tuesday, April 6.

(*Before Mr.* J. A. Campbell, *Chairman, Mr.* Baird, *Mr.* Lough, *and Mr.* Colville.)

NOTTINGHAM CORPORATION WATER BILL.

At the close of the proceedings on the Newark Bill reported last week, the Committee took up the consideration of the Bill promoted by the Nottingham Corporation to enable them to construct additional works and extend their limits of supply.

Mr. Pope, Q.C., Mr. Pembroke Stephens, Q.C., Mr. H. Y. Stanger, Q.C., and Mr. Harold Sands represented the promoters. The following Counsel appeared for parties affected by this and the preceding Bill: Mr. Balfour Browne, Q.C., Mr. Lloyd, and Mr. Hugh Hole, for the Newark Corporation; Mr. Erskine Pollock, Q.C., for the Nottinghamshire County Council; Mr. Shiress-Will, Q.C., for the Corporation of Mansfield; Mr. Reader Harris, Q.C., for the Southwell Rural District Council; Mr. Toller, for the Sutton-in-Ashfield Urban District Council; Mr. Worsley Taylor, Q.C., and Mr. Statham, for the Duke of Newcastle; Mr. Freeman, Q.C., and Mr. Rickards, for Lord Savile.

Mr. Pembroke Stephens, in opening the case, set forth his objections to the Newark Bill, between which measure and that promoted by the Nottingham Corporation there was, he said, a broad distinction. The Bill the Committee had been dealing with up to the present time had not been for doing anything, but one for preventing other people from doing something. It had been promoted by fear; and it was a countermove to something else. It was not in any sense dictated by necessity. On the other hand, the Bill he was presenting was one of the ordinary kind, where there was an undoubted necessity, and where works were proposed which were adequate and proper to meet it. But he had first to deal with the Newark Bill. The Committee knew it was really and

truly a measure of one clause. Limits and works were talked about; but it was simply a Bill with one protective clause. The Corporation of Nottingham were not there with the least desire to interfere with any of the towns in the immediate neighbourhood; and they would not call any persons marauders, or accuse them of stealing water. He would remind the Committee of certain admitted facts. Until six years ago, Newark had absolutely nothing to do with the pebble beds. They knew that for domestic purposes the needs of the towns might be met without any scheme of the ambitious proportions to which their last Bill had grown. It was said they wanted protection; and their notion of protection was a zone. This was quite a new idea; and if the principle were applied to other pumping-stations it would be absolutely unworkable. The Committee were invited to say that, no matter what the need of the population might be in the proposed protective zone, by Newark or anybody else, the area was never to have a pump put into it. Did anybody ever hear of a proposal of this character? He would now come to the Nottingham Bill, which was a matter of a very different kind. The Nottingham Corporation acquired their water-works from a Company, who had been in existence for many years; and nearly half-a-million of money was necessary for buying up the undertaking. The population in 1879, which was about the date of the transfer, was 217,000 within the statutory area; the limits extending to some 60 or 65 square miles. Since then, so great had been the development, that the population in the water-supply area was 280,000, of whom 235,000 were in Nottingham itself. Not only had the population increased thus rapidly, but there had been an addition to the purposes for which water was required. In 1879, the actual consumption might be taken at 11·14 gallons per head per day. It was now 13·28 gallons. This was merely for domestic purposes. Even in the smaller houses, baths were being introduced; and the demand for water for all purposes exceeded 20 gallons per head per day. The Committee would find that the total water supplies which the Corporation commanded were inadequate for the population. They acquired from the Water Company works at Zion Hill, Basford, and Bestwood. The Zion Hill supply was considered unsatisfactory, and the works were no longer used. The Basford, Bestwood, and Papplewick stations were those now existing; and in round figures they yielded 6 million gallons of water a day. The amount of storage the Corporation possessed at present was 9 million gallons or 1½ days' supply; and the Committee could see at once that this was an exceedingly narrow margin. To keep up the service, one engine had to be constantly at work; and in case of frost or drought, the danger was serious. At last a point had been reached when, in the opinion of the advisers of the Corporation, it was absolutely necessary, for the health of the population and the security of the service, to apply to Parliament for further powers. The question was: Where was the additional supply of water to come from? The learned Counsel went on to contend that the pebble-bed area was the natural field for Nottingham. The Corporation went to Woodborough and Oxton, and, under a provisional agreement, trial bore-holes were sunk. Water was found, and a supply could be obtained which would be a very useful reinforcement for the needs of Nottingham. The Corporation were applied to by certain local bodies for a supply; and in order to ascertain what population they would have to serve, the Corporation last year sought for a Provisional Order to take in the districts of Oxton, Woodborough, Epperstone, Thurgarton, Lambley, Radcliffe-on-Trent, and Burton Joyce. It was this application that led to the inquiry which had been referred to, and which had been treated in the Newark case as though there had been some decision against the Nottingham Corporation. The learned Counsel went on to explain the nature of the application, the scope of the inquiry, and the decision of the Local Government Board Inspectors. By the present Bill, the Corporation proposed to obtain the Oxton and Woodborough sites; and seeing the reasonableness of the suggestion made at the inquiry, they had, as a reserve power, included in the proposal the Boughton well, with the ordinary conditions of supplying all parishes on either side of the line of pipes. They purposed making a large covered reservoir, to hold about 10 million gallons, which would practically double the present storage. These proposals, if granted, would place the supply of water to Nottingham on an assured basis. Their engineering evidence would make it clear that there was a much larger field of water supply than the promoters of the previous Bill had been willing to allow. In conclusion, he said the needs of Nottingham were undoubted; the course pursued by them was general; and therefore the one question was: Is there water enough for us all? They hoped to satisfy the Committee that there was; and they trusted the Committee would pass the Bill, when the only other proposal submitted to them was the extraordinary and extravagant one put forward by Newark.

Wednesday, April 7.

Mr. Pembroke Stephens continued this morning his address on behalf of the Nottingham Bill; briefly reviewing each petition against it. Speaking with reference to the objection by Newark to Nottingham supplying within five miles of their line of pipes, he said that in the mouths of the Newark people it certainly was rather an extraordinary thing, for they knew that at a previous stage Newark thought they would never, under any circumstances, give up the power they had to sell outside their limits. By clause 5 in the present Bill, they carried on their Act of 1891, and applied for a wholesale power of supplying beyond the limits of the Bill; and yet, having done this, they actually objected to the Corporation of Nottingham having the usual power of supplying within five miles of their pipes. With regard to the petition of the Mansfield Corporation, which recited that the whole water supply from the Rainworth well was theirs, and that pumping at Boughton and Oxton would jeopardize their supply, the learned Counsel said the district contained a rapidly growing population, with every prospect of a further increase in the near future; and it was the petitioners' duty to preserve their water supply. In other words, the Committee must shut their ears to the needs of Nottingham, with its population of 280,000, and protect Mansfield with its population of 18,000 and its future needs. In effect, Mansfield said that to put down a Mansfield well was all right, but to put down a Nottingham well was all wrong. Proceeding to deal with the objection to the Woodborough and Oxton wells, Counsel said the allegations that the present scheme was the same as that promoted last year were only made in order to give colour to the suggestion that the Nottingham Corporation had had an adverse decision given against them. Parties in the south said go to Boughton, and those in the north said go to Woodborough and Oxton; so that if the Committee satisfied everybody, Nottingham would have no well at all. The learned Counsel passed on to deal with the other petitions.

The following evidence was then given:—

Mr. *D. M. F. Gaskin*, M.Inst.C.E., the Water Engineer to the Nottingham Corporation, examined by Mr. Stanger, said the total area of the limits of the Nottingham supply was 17 square miles within the borough, and 55¾ miles outside. Witness produced tables showing the quantity of water pumped, and how the supply had decreased. In 1881, the number of gallons obtained for all purposes was 18·18 per head per day. In 1892, the quantity supplied was 21·19 gallons per head per day. Explaining the present water supply, witness said the Park Row pumping-station was not used, and that it was upon Basford, Bestwood, and Papplewick that the service depended. From these wells there was a total yield of 6,048,000 gallons per day; and to obtain it they had to keep all the pumps going. He next gave the figures relating to the capacity of the various reservoirs, the total of which was 9,699,935 gallons. The consumption per head per day was 19·96 gallons; and this on a population of 280,000 gave a daily supply of 5,600,000 gallons. Taking the maximum yield at 6,000,000 gallons a day, they had storage capacity for 1½ days. The wells during the past few years had been very seriously drawn upon; and in case of a drought or a frost, Nottingham would be placed in a dangerous position. For a great number of years, there had been given a continuous supply; and if stopped it would be attended with great danger in times of frost. The surface-level of the Basford pumping-station was 169 feet; and the water-level, 104 feet. The latter had not been changed for many years. At Bestwood, the surface-level was 308 feet, and the rest-level of the water in 1885 was 175 feet; while in 1894 it was 147 feet—a diminution of 28 feet. At Papplewick, the rest-level of the water in 1886 was 195 feet; in 1894, it was 175 feet—a diminution of 20 feet in eight years. Witness also produced statistics with regard to the rainfall for the past 29 years. Considering the fact that the yield was so very near to the maximum demand, further supplies were absolutely necessary. The last Royal Commission on Water Supply recommended 35 gallons per head per day for London; but, in his opinion, 25 gallons per head per day would not be sufficient for Nottingham, as during the hot summer of 1895 the consumption rose to 29 gallons. He thought it was necessary to double the existing supply, giving another 5½ million gallons. Trial boreholes had been sunk at Woodborough and Oxton; and witness gave the distances between the proposed wells there and the existing wells. There was no borehole at Boughton. A site had merely been secured. This was 17¾ miles from the Basford well. In his opinion, none of the existing wells were likely to be interfered with by any one of the three proposed wells. Witness described the result of the boring at Woodborough, where at a depth of 60 feet the water flowed at the rate of 2 million gallons a day. The yield gradually increased from 87 feet to 120 feet; the bulk of the water being obtained at the latter depth. The boring was plugged at 430 feet. The water rose 14 feet above the level of the ground; and he estimated there would be a permanent yield of 2 million gallons. The water had been analyzed by Dr. Clowes, and had been found to be of excellent quality at a temperature of 51° Fahr. At Oxton, the borehole was sunk 500 feet. At 112 feet, water sprang from the ground, and then rose to 91 feet from the surface, at which point it remained stationary. For 60 hours, 5000 gallons an hour were pumped; but this only lowered the rest-level 2 ft. 6 in., and he estimated there would be a permanent supply of 1½ million gallons a day. As soon as the water was pumped out at Oxton, he noticed it almost immediately disappeared; showing that the ground was very porous. No boreholes or experiments had been made at Boughton, but he estimated that it would provide a supply of between 2 and 3 million gallons a day. With this supply, they would be able to give the existing wells a rest, and this was highly desirable.

In cross-examination by Mr. Pember, witness said the reason no boreholes had been made at Boughton was because the Water Committee had decided, for reasons of their own, to adopt a third station. There had not been time to prepare statistics in regard to Boughton, as at the date of the inquiry it was only indicated that the Corporation might possibly have to go there. He did not think the Woodborough station would do any damage to the Dover Beck. His experience guided him to make this admission. He had noticed that, while the Woodborough borehole was running over, from careful observation of the springs there was no difference at the time.

In cross-examination by Mr. Shiress Will, witness said he thought they could get 3½ million gallons of water by extended works—driving headings. If two wells were sunk in the Boughton area, they could get from 6 to 7 million gallons a day. He combated the suggestion that the Oxton well would drain the Mansfield well dry.

By Mr. Balfour Browne: He would not say that the Oxton well would not affect the Mansfield one. The reason they sank to a depth of 500 feet after finding water at 112 feet was to prove the strata, and to guide them in erecting their works. He admitted that they might pump from the bottom of the pebble beds. He did not think the exhaustion of the old storage-ground in the pebble beds by pumping was the cause of the drying up of the Dover Beck.

Mr. Balfour Browne: Is not this what you said at Nottingham: "The existing wells have exhausted the storage water"? If that was so, must it not be exaggerated when you put down more wells?

Witness: Yes; but there is a distinct cone of exhaustion.

Is it a fact that, the farther you go down, the greater is the cone of exhaustion?—Undoubtedly.

Might not the biggest cone of exhaustion pump a well 3½ miles away?—I do not think it would; but no man can pledge himself.

In further cross-examination, witness said the Corporation proposed *bonâ fide* to go to Boughton for a supply, and to put in between Boughton and Nottingham a 21-inch pipe to carry 3 million gallons a day. But supposing they could get enough water at Oxton, he admitted that it would cost much less to sink there. He believed they could get all they required north of Boughton, by sinking at different places.

Thursday, April 8.

Mr. *Gaskin* was to-day further cross-examined by Mr. Balfour Browne. Questioned first as to the accuracy of his population tables, witness said

the number of people living in the Nottingham area in 1891 was 242,322; showing an increase of about 50,000 in ten years. When the Corporation applied for their Provisional Order last year, they said that, with their present sources of supply, without Oxton and Woodborough, they could serve not only Nottingham but the outside parishes also to the extent of 100,000 gallons a day. It was the intention to put down plant at Woodborough to raise 2 million gallons of water daily, and to pump this quantity, which was all that could be permanently depended upon from the wells. The effect of pumping was that the rest-level went down some 23 feet. The desiccated condition of the district might be accounted for by deficient rainfall.

Mr. Balfour Browne: There is only one other way of accounting for it, and that is by excessive pumping.

Witness: I should say so; but I must take into account that there has been a deficiency of rainfall.

But I want you to admit that there are only two ways of accounting for the desiccation—either deficiency of rainfall or excessive pumping. If I can show you that there has been no deficiency of rainfall, we are agreed that the desiccation is due to excessive pumping?—Yes; but there is a deficiency of rainfall.

Witness was then cross-examined at some length upon this question, in connection with differences in the figures contained in his own tabulated returns and those given in the meteorological statistics of the borough compiled by the Borough Engineer (Mr. A. Brown, M.Inst.C.E.) and the Medical Officer of Health (Mr. P. Boobbyer, M.B.). He said he could not account for the differences; but the figures he had put in were taken from those he had in his office, though he could not say how they came there. Counsel submitted to the witness that if the figures before the Committee were correct, and the desiccation was not due to drought, it must be due to excessive pumping; and witness admitted that the matter might be put in that way. He added, however, that witnesses were coming who would be more competent than he was to speak on this point. In further cross-examination, he said he thought the fact that Boughton would not interfere with the existing wells had influenced the Water Committee of the Nottingham Corporation in going so far north. Of course, it was an advantage to have the pumping-stations nearer. The question of cost was considered; but the Committee decided not to let this stand in their way. The cost of laying the main from Boughton would be £48,000; and the expense of sinking wells from £8000 to £10,000. He did not suppose the Nottingham Corporation would object to another well being sunk, if it was a reasonable distance away from Boughton; but they would object if it was likely to affect their supply. Having been examined on the details of the scheme, the total cost of which is £300,000, the learned Counsel proceeded to put to the witness questions as to an alternative scheme.

Mr. Pembroke Stephens objected.

After some argument, the Committee ordered the room to be cleared while they considered the matter. On the re-admission of the public,

The Chairman said the Committee had considered the objection that had been taken, and they felt that their duty was to consider and decide upon the merits of the two Bills before them, and not to go into an examination of an alternative scheme. At the same time, they thought that a question might be put to the witness as to whether, if there appeared to be serious difficulties in sanctioning the Nottingham scheme, the wants of the town could be supplied by such a project as was set forth in the petition of the Newark Corporation and other objectors.

After some explanation as to the exact meaning of the Chairman's question,

Witness said if they could not get the scheme, and there were serious difficulties, no doubt they would have to go somewhere else; but he personally had not considered any other scheme.

The Chairman: You can give no opinion.

Witness: Not beyond the scheme before the Committee. Probably some other witness with a more extended experience of gravitation works might be able to answer the question better than I can do.

The cross-examination of the witness was then continued on behalf of the Nottinghamshire County Council, the Southwell Rural District Council, and the Hucknall Torkard Urban District Council. In answer to questions by the learned Counsel representing the last-named body (Mr. Fitzgerald), witness stated that with the Oxton and Woodborough wells Nottingham would be able to supply a population of 480,000; and he calculated that in fifteen or twenty years they would require a supply for 350,000 or 400,000 people.

Cross-examined by Mr. Freeman, on behalf of Mr. J. L. Francklin, witness said that, in his opinion, the Woodborough well would not obtain the waters of the Dover Beck direct. If Mr. Hawksley's scheme of 1869 had been carried out, landowners and others injuriously affected would have received compensation, either in money or in water. He admitted that by sinking the proposed well, and so obtaining underground water instead of surface water, the Corporation would avoid paying the compensation which would have had to be paid had the scheme of 1869 been sanctioned.

Friday, April 9.

On the re-assembling of the Committee this morning,

The Chairman said he wished, before resuming the proceedings, to add something to what he said on the previous day. The decision of the Committee did not contain any reference to the whole scheme, or to the scheme as a whole, but alluded to serious difficulties being found in granting the Nottingham scheme. The Committee respectfully asked the Counsel for the promoters of the Bill, so far as was consistent with justice to their clients, to direct their application to the Oxton and Woodborough stations, and not to dwell more than was essential on the necessity for the station at Boughton, to which there appeared to be apparently little opposition. The Committee made this suggestion with the view of saving time.

Mr. Pembroke Stephens said at present, so far as the promoters were concerned, Mr. Gaskin was the first witness they had called. This was the third day of his cross-examination; and therefore it could not be said that the promoters had erred in the matter of time. The suggestion of the Committee would receive attention; but he should like to have the advantage of Mr. Pope's presence before deciding future procedure.

Mr. *Gaskin* was then further cross-examined on behalf of various opponents of the Bill. In the course of his replies to questions, he said he did not think the Oxton boring would prejudicially affect the proposed well for Sutton-in-Ashfield. Woodborough and Oxton would suffice for Nottingham; and if these stations were sanctioned, the Corporation would be willing to compensate anyone who might be injured thereby.

Re-examined by Mr. Stanger, witness said if the Corporation were allowed to roam at large over the whole field of the pebble beds north of Boughton, and erect pumping-stations at various points, they might get 6 million gallons of water per day; and in spite of power to drive adits in any direction there, they could get more than 2 million gallons a day from one pumping station. The natural flow of the water in the pebble beds was from north-west to south-east.

Mr. *A. Brown*, M.Inst.C.E., the Borough Engineer of Nottingham, was the next witness. He was not able to explain the discrepancy in the figures as to rainfall pointed out by Mr. Balfour Browne on the previous day, but he said he would ascertain the cause of it. Witness gave statistical evidence of the rainfall in the Dover Beck district. He said that during the past thirteen years there had been a great number of dry winters; and he attributed the deficiency of 1896 as compared with the gauging of 1869 to a falling off in the rainfall. He thought there was every expectation that the population of Nottingham would increase largely in the next few years; and therefore it would only be right and prudent to make provision for it, and also against frost. Witness was then taken through a series of tables giving the gaugings of the rainfall over the Dover Beck drainage area. He said he did not know much about the Dover Beck, though he was a native of Nottingham.

Mr. *W. Collier* was next called. He said he lived at Calverton, one of the parishes to be taken over under the Nottingham Bill, and was Chairman of the Parish Council during 1895 and 1896. The Council had resolved to support the Corporation, and supply water upon the same terms as they did.

In cross-examination, witness said Calverton did not care where its water came from—whether from Oxton, Woodborough, or Papplewick—so long as it was of good quality. Calverton was really in the Basford district; but if Basford laid a pipe to supply the parish, and took the water from Nottingham at 6d. per 1000 gallons, it would be more expensive than having it direct from the Corporation. In 1868, the Dover Beck was double its present size; but the millowners allowed the sluices to remain open, and this caused waste. The stream had not been very large of late years. Though he supported the Woodborough scheme, a supply from Boughton would suit his purpose equally well.

Mr. *P. Boobbyer*, Medical Officer of Health for Nottingham, said he thought many of the streams in the parishes of Calverton, Woodborough, and Lambley were liable to be polluted. This gave rise to a danger of an outbreak of typhoid fever. A new supply of water would remove one serious source of disease. The Nottingham Corporation had condemned the dry closets, and water-closets were gradually being substituted. This would enormously increase the demand for water for domestic purposes. They were doing away with rain-water cisterns on sanitary grounds; and this would also create a further demand for water.

The Committee then adjourned over the Easter recess.

The North Walsham Water Scheme Disapproved of.—As already reported in the "Journal" the Local Government Board would not sanction a loan to the North Walsham Urban District Council because it was proposed to take water from the gravel. The Council then offered to sink a well in the chalk, so that any water from the gravel would be excluded. To this the Central Board reply that they are advised that there is no reliable stratum of clay between the gravel and chalk; and so the proposal to obtain water from the chalk below the town could not be approved. The Board would not, as an alternative, be prepared to sanction the loan of £4000 for the execution of a scheme under which the water would be taken from the chalk below the town, even if precautions were adopted for preventing the water from the gravel from entering the well. The District Council have decided to ask their Engineer to advise them what is to be done under the circumstances.

The Rejection of the Southampton Water Bill.—In the "Journal" for April 6, there was noticed the report of a Sub-Committee of the Parliamentary Committee of the Southampton Corporation on the subject of the collapse of the Bill which had for its object the purchase of the South Hants Water-Works. The report came before the Council at a recent meeting; and, in moving its adoption, the Mayor (Mr. E. Gayton) gave the members a full explanation as to their present position in the matter. Briefly he said that they, as a Corporation, had redeemed the pledges made to those living in the outside areas, or had tried to do so. They had been unsuccessful owing to a technicality, which they all extremely regretted, because they felt sure that, if the case had been fought out on its merits in the House of Lords, there would not have been the slightest doubt but that the Bill would have been by that time virtually carried. It would suffice to say that they intended to prosecute their endeavours; and, if possible to redeem the pledges made at the Local Government Board inquiry in connection with the extension of the borough, when they promised to secure, if they were at all able, lower priced water to those living in outside areas. They had done their duty in the interests of the whole of the ratepayers, and though it had cost, and would cost, a considerable sum of money, he believed that, if they went through the same proceedings again at the Guildhall, they would receive the same almost unanimous support as they did on the last occasion. Sheriff Walton, in seconding the motion, denied that the ratepayers had been misled at the meeting at the Guildhall. All that was said was that the Bill was of a permissive nature, and that, after obtaining it, they would have breathing time to determine whether or not they would put it in operation. Since the overthrow of the Bill, the Parliamentary Committee had passed a resolution in which it was proposed to negotiate with the South Hants Water Company, with a view to arranging terms on which they would supply the Corporation with water, in bulk, for the added areas; the Corporation taking over the pipes and plant in these districts, and thereafter controlling and working the same. They hoped these negotiations would have a satisfactory result, and that the burdens under which the added areas suffered would be removed. An ineffectual attempt was made to postpone the discussion of the report until a return was presented as to the costs of the abortive proceedings; and the original motion was passed by 21 votes to 16.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Thursday, April 29.

(*Before Baron* POLLOCK *and a Special Jury.*)

Fox v. Jerome—Water-Gas Libel Case.

The hearing of the action brought by Mr. Samson Fox against Mr. Jerome K. Jerome, the Editor of "To-day," Mr. Dunckerley, the publisher, and Messrs. Wyman and Sons, the printers of the paper, to recover damages for alleged libel, was resumed to-day after the Easter Vacation.

Sir FRANK LOCKWOOD, in opening the case on behalf of the defendants, admitted that the onus of proving that the statements in the alleged libels were true rested with them. He said that the course Sir Edward Clarke had pursued, of putting the plaintiff in the witness-box, had considerably shortened the case, as the vast body of evidence he was in a position to call had been rendered unnecessary by reason of the admissions Mr. Fox had made in the course of his examination. The charges published in "To-day" were most serious ones—affecting as they did the reputation and integrity of the plaintiff. But the defendants would show that the newspaper, in the discharge of what was considered to be its duty, had laid bare a series of disgraceful transactions, which had resulted in the pecuniary benefit of Mr. Samson Fox, and possibly of one or two of his nearer associates. The public had been the milch cow. The paper was doing its duty in fearlessly exposing Fox and his methods. The whole of the discussion arose in the newspaper by reason of a gift of £45,000 to the Royal College of Music. They were told that Fox was a man who delighted in music; and that he had for some years past entertained the artistic notion of benefiting the Royal College of Music. This was not done in a corner; the light of Mr. Samson Fox was not hidden under a bushel. The announcement was placarded over the land. His learned friends had been anxious to show that Fox was a man rolling in wealth—that he had a big estate at Harrogate, and had accumulated great savings. But how far did that avail them? The source of the £45,000 was shown when the bank-books were produced. In an account into which the moneys coming from the public subscriptions to the Companies were paid, in a very short time the enormous sum of £234,000 was entered. The money paid to the Royal College of Music was clearly part of the puffing, advertising scheme which Fox had set on foot to gull the public, to induce them to go on supporting him in the promotion of these schemes. Another thing was to advertise throughout the length and breadth of the land the name of Samson Fox. His learned friends said Fox had other properties and investments, and had many sources from which he could have got the sum named; but the defence was that the amount came from the moneys subscribed by the public. "To-day" criticized and strenuously condemned the gift in May, 1894; but the plaintiff did not bring the action till January, 1896. The Company campaign, which had been conducted by Fox with such eminently satisfactory pecuniary benefits to himself and such disastrous results to the public, had taken place mainly in 1889. But public opinion had not been called to it; and why? The Jury had heard of the buying-off of the actions against the North British Company. In the libel—if it was a libel—after commenting on the gift, mention was made of the "notorious Cottam" as an associate of Fox. The learned Counsel said on one occasion Cottam was in Court during the examination of the plaintiff; and they hoped to have seen him in the witness-box. These hopes, however, had been doomed to be blighted. But whatever kind of man he was, Fox was hand-and-glove with him; and he would show how Cottam did the dirtiest of all the dirty work. One could not touch pitch without being defiled; and Fox could not excuse himself by saying that it was Cottam who did this, and Cottam who did that. The defendants spoke of Cottam as notorious for his audacity, notorious for his mendacity, and notorious for his dishonesty; and he was Fox's right-hand man in these transactions. Did the Jury think that Cottam, if he had been called, would have been willing to take all the responsibility on himself? Would he have been content to say: "I was the villain of the play, and Fox the deluded maiden?" Cottam was in Fox's pay. He was being used for the purpose of promoting the Companies; and by his work, and rascality, and ingenuity, and knowledge of company promoting, Fox was content to profit, and was content to pay. Now, forsooth, he would ignore Cottam, and assume that by neglecting to put him in the witness-box he would escape from his misdeeds. After reading one of the libels, the learned Counsel asked if there was a syllable in it which had not been shown in the presence of the Jury to be absolutely and literally true? If it was true, then every word had been justified. This was the keystone of the whole structure. In the month of May, 1894, the defendants shortly, succinctly, and comprehensively stated the charge against Fox. It was a terribly melancholy story, that Fox should have been so successful that he should have been, by the employment of his associates, whom he knew to be so disreputable that he could not call them as witnesses, able to transfer from the public in the course of a few weeks such vast sums of money. He was not representing those who had lost their money; but he appeared on behalf of the paper which had discharged a public duty in unmasking this man, and showing the methods by which he had been able to go into the witness-box and, by the invitation of his Counsel, parade the wealth he had accumulated. Taking the Jury back to a history of the Companies, the learned Counsel reminded them that the old Leeds Forge Company were apparently doing a thriving business; being managed by men who, to their credit be it said, had risen from the work-bench. Fox was a shareholder in the old Company, to the extent of 1298 shares in 1888; and it was said by him that it was not until quite the later months of that year it occurred to him that the reconstruction should take place. He (the learned Counsel) would attribute a much earlier date, and suggest that something of the kind was intended about the middle of that year, when Fox determined to capitalize the royalties being paid to him by the Company for shares. What other reason than reconstruction could be given for the increase of his shares from 1298 to 11,375, which represented something like a quarter of the capital of the new Company about to come into existence? They knew the scheme of reconstruction provided for the holders to receive an equivalent number of shares, with the enormous bonus of £6 a share. Then the Fox birthday banquet of July, 1888, was advertised, just in the same way as the gift to the Royal College of Music; and he suggested that this also was paving the way for reconstruction. He thought he should be able to show that Fox was inaccurate in saying that he had not the advantage of Cottam's acquaintance until the autumn of 1888, because Cottam visited the Leeds Forge much earlier than that; and his visits were not as a mechanic nor as an experimenter in water gas. In the 1887 balance-sheet of the old Leeds Forge Company, the valuation of the plant, machinery, fixtures, land, &c., was put down at £285,000; and Fox was perfectly willing, in his cross-examination, to accept this figure, to be compared with the £525,000 in the prospectus of the new Company. When his attention was drawn to the inequality of the comparison, he said that the old Leeds Forge Company had a perfect right to write down the value considerably lower than it was; but it was more than this. The Jury, as men of business, were not going to accept this explanation, which was untenable. They found that £285,000 worth of material, at one fell swoop, became £525,000 when it came to be dealt with for the purposes of sale; and Fox offered no explanation. Mr. John Scott, the Chairman of the Company, said that the latter sum included the price of certain patents for making pressed steel frames, which Fox agreed to sell for the enormous sum of £96,000. Who valued the patents; and how was the sum arrived at? If the agreement was not a sham, Fox sold the patents to the old Company on the eve of the reconstruction—on the same day that it disposed of everything. Why did he not sell to the new Company direct? It was curious to observe what was the position of the unfortunate new Company in regard to the patents for pressed steel frames. Certain sums, they were told in the prospectus, were to be provided for the erection of machinery to work the patents up to £150,000. This process of inflation was pursued in an unwarrantably dishonest manner by the exaggerated value put on the plant, machinery, &c. Mr. Craven, the valuer for the new Company, they were told, was a gentleman of high respectability and great experience; and this gentleman being dead, he did not wish to say anything to the contrary. But how was he asked to value—not on the basis of the thing as a going concern, but on the basis of a monopoly. Who was to say how wide and far afield a valuer might go? He was to consider that the patents were unassailable, that competition did not exist, and that the Company were to regard themselves as the one and only set of manufacturers who could supply these things. He thought Mr. Craven would have admitted that he never before in his professional career had been called upon to make such a valuation. Hardcastle, the Auditor of the old Leeds Forge Company, did not sign the statement in the prospectus of the new Company. He was not in this country; but he (Sir Frank) was in a position to put in letters from Hardcastle to Fox. Hardcastle refused to sign the balance-sheet; and they turned elsewhere for an Auditor, who was supplied by the accommodating Cottam. In the new Leeds Forge prospectus, it was said that water gas effected a saving of £10,000 per annum in fuel and labour at the Leeds Forge; and that the Company had the monopoly of water gas for flue welding. This was admittedly untrue; and the saving of £10,000 was not proved. In the prospectus, they had an instance of how a small business might, by the professional process of exaggeration and misrepresentation, be foisted on the public. Its capital, multiplied by hundreds, was foisted on the public, with the result that it made one flitter of existence, and died out; and what was left? Fox was the man who had made the money. His banking account had prospered; but the shareholders had not derived one penny since 1891. Fox was the man who came posing as an honest Yorkshireman, and asked for damages in respect of his character being unjustly assailed. He would get what the Jury gave him; and he hoped that this action would not be one of the undertakings resulting in a benefit to Fox. The Leeds Forge Company, like all of Fox's schemes, had a wonderful future before it. It had failed, for the reason that the price sought to be obtained by Fox was a greedy one. They were agreed that water gas was not the invention of Fox, and that he only had a process. The defendants' case in regard to water gas was that they were going to satisfy the Jury that, so far from Fox having any monopoly in the production of water gas, there were, at the very time his schemes were being foisted on the public, other processes by which water gas, quite apart from the patents of Fox, could be produced, adopted, and used as favourably as it could be under Fox's system. Therefore he was entitled to say that the patent of Fox was of no value, and they were not the monopolists they claimed to be. The assured commercial success of water gas had not been achieved in 1889. It had not been achieved now; and really very little had been accomplished. How was water gas introduced by Fox? Some employees of the Leeds Forge Company—Pollard, Tordorf, and others—had some cash in hand for investment; and Fox, having had his attention drawn to the patents of the European Water-Gas Company, suggested that these gentlemen should join him in accumulating a sum of £40,000 to be used for their purchase. But how remarkably prudent a man Fox was, for though they found him afterwards pocketing in one sum £150,000 in the purchase of the patents, he never was himself a halfpenny out of pocket. The agreement with the employees was that they should receive back the principal, with 100 per cent. either in cash or shares; and as the shares were at a premium, all preferred to take them. Fox then gave them vendors' shares; but Pollard, who tried to screen Fox in the witness-box, said that had he known he could not have disposed of the shares on the market, he would not have taken them in preference to cash. The greed of Fox was as conspicuous as his trickery. In March, 1889, the British Water-Gas Syndicate came out. How many of the public would have subscribed to it if they had known that the patents which Fox was selling at £217,000, were patents in respect of which he had not paid one farthing of money? Mr. Tordorf had admitted in the witness-box that the Engineer had told him that the cost of producing water gas was about 1s. per 1000 cubic feet, and not 4d. The main point of attack in the defence was the representation that water gas was a commercial success. The object of the parent Syndicate was not to carry on business, but to bring out subsidiary Companies; and it was incredible that anyone should have had the audacity to carry out such a scheme. The right to use the patent was being sold at the rate of £100,000 a county! According to Fox, who was a judge of music, the

Yorkshire Water-Gas Company died of lack of harmony; but that infant really died on account of the incompetence of the nurses supplied by Fox. It got out of the public during its little life £131,000, but did no business. The pooling arrangement, by which certain gentlemen, including the plaintiff, purchased shares in the Syndicate for special settlement, had for its object the keeping up of the price of the shares; and the defendants in their paper truly said that this was a rig. The conduct of the Directors of the Notts and Derby Water-Gas Company was like an oasis in a weary wilderness of fraud. They refused to pay the consideration-money; and an action was commenced against them by the British Syndicate. The defence alleged fraud; and the action was settled for £15,000—very little to the credit of the Syndicate, or of Samson Fox. Fox came into Court saying that there were imputations of fraud made against him; yet they found him buying off similar imputations in 1889. The North British Water-Gas Company was the most complete exposure of the methods of Fox. Before the Company started on their career, Mr. Donald Graham, who was to have been a Director, made objections; but the matter was hurried through, and the prospectus was published. Mr. Graham insisted on resigning; but his name had been used as a bait on the prospectus. The North British Company never did any business; and when actions were brought, they were settled. Fox's speech at the statutory meeting of the British Syndicate, in May, 1889, was the culminating point of his audacity. He said they had fixed concessions amounting to £1,000,000; but the contracts were made with Cottam, and were a sham. The amalgamation of the Water-Gas Companies in 1893, was done to postone the day of reckoning. The Jury would say that the defendants were right in denouncing the amalgamation as a scheme which gave breathing-time and postponed the investigation of the Liquidator. What had been the result of the work of the Companies? The experimental works at Newburn-on-Tyne were a failure; and not a penny had been paid on them. Water gas had failed everywhere in this country—it was one long, dismal record of failure. He did not say that, merely because there had been failure, bankruptcy, and loss, the Jury were entitled to draw an inference that there had been fraud. Many an honest man had tried and failed. But the other circumstances of this case pointed to a long drawn out scheme of deception. He hoped he had satisfied the Jury that Mr. Jerome, who was responsible for the articles in "To-day," had not transgressed the bounds of proper criticism; and he asked them with confidence to say that the charges—serious as they were, and disastrous to Fox's reputation—had been proved to be true in substance and in fact.

Friday, April 30.

This morning, evidence was called for the defence.

Mr. *Ewing Matheson*, a mechanical engineer, and Managing Director of the Farnley Iron Company, was the first witness. In answer to Mr. BIGHAM, he said he knew, from the prospectus of the Leeds Forge in 1889, that Mr. Fox claimed a monopoly in the manufacture of corrugated flues. He never questioned it; but, having begun to make corrugated flues in 1887, he went on doing so. In 1889, the flues of the Farnley Company were spiral; while those of the Leeds Forge were annular. There was little or no effective difference between the spiral and annular flue. They got practically the same results from one as from the other. The Farnley Company had a search made, and found a patent for a corrugated flue taken out in 1853. Having examined the specifications, he, as a skilled man, thought they disposed of the notion of Fox that the Leeds Forge had a monopoly of corrugated flues.

Mr. BIGHAM: Has the process patented by Fox secured any advantage over those previously in use?

Witness: Yes; in the original patent of 1853 the furnace was riveted, and therefore the machinery for making them differed from that of Fox. Fox's furnace was welded; and this was an advantage. Everybody welded flues at that time. Fox took a welded flue, and corrugated it.

In 1888 were the Farnley Company making and supplying flues?—Yes; and in 1889 a gentleman, who I believe was a Manager of the Leeds Forge, spoke to me on the matter, and warned me.

Did you after the warning persevere in the manufacture of corrugated flues?—Yes; we executed orders for them in competition with the Leeds Forge. They took no legal steps to restrain us. Now we make the annular flue.

Did the competition produce any effect in the price?—Yes; owing to ours and Brown's competition, the selling price of corrugated flues fell very considerably—from £65 to £45 a ton.

Sir E. CLARKE, in cross-examination: Do you mean that the prices of the Leeds Forge have fallen?

Witness: We were told so.

Is it a fact that till 1892 you never made an annular flue?—Till 1891 or 1892.

As a matter of fact, after the time when the patent expired you began making annular flues?—Yes; because buyers preferred those flues. I prefer the spiral.

Have you ever supplied flues to Her Majesty's Navy?—Yes; for two ships about a couple of years ago.

That order has not been repeated?—No; because they have given up using annular flues in the Navy.

Does the Board of Trade formula for corrugated flues of Fox and Morrison's pattern, give more strength than for your flue?—Yes; the authorities give it so, and Lloyd's is in favour of the annular flue.

You have to make a greater thickness in order to get the approval of Lloyds?—Yes; but we could get the same results without. I am not one of the persons who joined together with regard to the libels; and I have had nothing to do with giving the information which the defendants published. I was only asked about this matter two months ago. The Farnley Company have supplied 400 to 500 of the flues altogether.

Re-examined by Mr. BIGHAM, witness said he had no personal animosity against the plaintiff.

Mr. *H. E. Newton*, a member of the firm of Newton and Sons, patent agents, was examined by Sir F. LOCKWOOD. He said that he had seen the prospectuses of the Leeds Forge Company and of the British Water-Gas Syndicate. Mention was made in the former of the pressed steel frame patents and corrugated flues, which was one of the monopolies secured by the Company; and it was said that the Company had the monopoly of water gas for flue welding. In all, Fox had 19 patents for the corrugated flue; and he had made a complete search, and found that early in the present year only one of them was still alive. He had also made an examination of the water-gas patents mentioned in the British Water-Gas Syndicate's prospectus. Mr. Wilson, who was mentioned in the prospectus, had nothing to do with water gas; and his apparatus was for making producer gas.

Sir E. CLARKE: That is so stated in the prospectus.

Witness (continuing) said neither Wilson nor Dawson had patents for making water gas. Those mentioned in the prospectus related to water-gas patents and magnesia comb patents.

Sir F. LOCKWOOD asked witness whether the exclusive right to use the comb combination was secured to the Syndicate.

Sir E. CLARKE objected, as in the particulars it was simply alleged that the patents "were of little or no intrinsic value." This was distinct from the question whether they gave a monopoly.

Sir F. LOCKWOOD: In your opinion did these other patents secure to Fox the monopoly in the production of water gas?

Witness: All the patents were in force at the time of the prospectus; but water gas was known long before the date of the first patent. The principal patent which belonged to the Syndicate was that of Bristow Hunt; and that was anticipated by prior publication.

Sir E. CLARKE said that was not in the list at all.

Sir F. LOCKWOOD replied that it was under another name; and as witness thought that it was the master patent, he would attack it.

Sir E. CLARKE said, where the plaintiff was charged with fraud, the particulars ought to be strictly regarded; and it was hard on the plaintiff that, on the eleventh day of the trial, a sudden allegation should be made that the patent was anticipated by one which they had never heard of until then.

Baron POLLOCK thought the matter was one of great importance to both sides; because if the defendants merely gave a sort of general evidence to the Jury as to validity of the patents, the case for them would be very much weakened. On the other hand, it would be extremely unfair to the plaintiff that evidence against which he was not prepared, should be admitted without his being able to contradict it. The defendants were confined to the paragraph in the particulars relating to the monopoly. It would be an injustice to the defendants, as well as to the plaintiff, if he allowed the case to go off on that point. Having so ruled, he ought to give consideration to an application by the defendants to amend, even though the expense and delay might be serious.

Sir F. LOCKWOOD: I should like to give this evidence; and I would ask your Lordship to make any necessary amendment to enable me to do so.

Sir E. CLARKE said the specific application was to amend the particulars of justification, so as to allege that certain of the patents were invalid. He submitted that it would be most unjust to the plaintiff to do this. The patents were enumerated in the prospectus published on March 22, 1889; and the libels complained of began in February, 1894. Particulars were given in May, 1896; and therein no allegation was made that any of the patents were invalid. The first allegation of the kind was contained in the particulars given in March last, when the case was in the list for trial; and now, in the middle of the trial, which was of the most serious kind, the defendants asked to put in another amendment to raise the question whether the patents were in fact invalid. Even then they would have to prove that Fox knew them to be invalid. He submitted that it would be extremely unjust to call upon the plaintiff to prove the validity of patents taken out twenty years ago, when this question had been open to the defendants all the time.

Sir F. LOCKWOOD said he was informed that Mr. Danckwerts raised the question of the validity of the patents in Chambers.

Sir E. CLARKE strongly objected to this statement. His junior informed him it was not so.

Baron POLLOCK had no doubt that the evidence certainly ought not to be given without amendment. According to the older practice, the Court would not have allowed the amendment; but he thought the Court ought to give leave to amend, so as to let the real issue be brought before the Jury. The cost of the adjournment must be paid by the defendants.

Sir F. LOCKWOOD said, rather than have any adjournment, he would dispense with the amendment, and would content himself with a general answer.

Witness then said that he should regard the validity of the patent No. 8757 of 1884 as doubtful, on the ground of anticipation by the patent of Nawrocki of 1884. The patents in the prospectus were not necessary to the manufacture of water gas, and were simple modifications of the master patent of Hunt.

Cross-examined by Mr. COLEFAX: I have seen water gas made at Sheffield; but I cannot say I am conversant with the chemistry of its manufacture. I do not know whether the gas-generator in use at the Leeds Forge is successful or not. The patents of Pieper, Lake, and Blass could be used quite apart from carburetted water gas.

Mr. COLEFAX: Therefore it is not true to state that Pieper, Lake, and Blass are simple modifications of Hunt?

Witness: Hunt is not confined to carburetted water gas.

As regards water gas itself, you, as a patent agent, can say that the only patents which could be made covered details for apparatus for the manufacture of water gas?—Yes.

The best way to get control of water gas would be to get a chain of patents?—You could not get the control of water gas. The patents of the British Syndicate only gave a monopoly of one way of making it. I do not consider that Lake was the first and true inventor. He described a gas-generating furnace, part of which was the water-cooled ring, which serves the purpose of protecting the junction between the narrow and wider parts of the furnace.

I put it to you that, by having the water-cooled ring instead of brick-work, you prolong the life of the furnace?—I am not competent to state that.

Nawrocki, who you say anticipates Lake, did not have the water-cooled ring at all?—I think he does. If the drawing was enlarged, you would find that it projected into the fuel. I say they are identical.

In making water gas, the heat in the furnace is very intense?—Yes; because the coke has to be brought up to a high state of incandescence. Slag sticks to the brickwork of the furnace; and considerable force has to be used to remove it. In Lake's specification, the water-cooled ring was at the hottest part of the furnace; and if brickwork was used instead of the

cast-iron plates, the life of the furnace might certainly be considerably shortened.

You do not suggest that in Nawrocki's specification there is a claim for a water-cooled ring?—No; it is simply the drawing that I rely upon, though there is a water-cooled ring named in the specification. I suggest that the water-cooled ring of Sutherland caused the slope, and not the brickwork.

By Sir F. Lockwood: The object of the water-cooled ring was to keep part of the furnace cool. There was apparently no novelty in the use of this ring. In another patent of Sutherland's, there was a water-cooled ring; but in this case, the ring did not come into contact with the fire. Hunt's patent was for producer gas, water gas, and carburetted water gas.

Sir F. Lockwood: I think that, as my learned friends have cross-examined with regard to Hunt, I am entitled to ask if that is a valid patent.

Baron Pollock: No; I do not think that is so.

Mr. *A. M. Paddon*, Assoc.M.Inst.C.E., examined by Mr. Danckwerts, stated that he had had experience in the manufacture of gas, including water gas. He had been in the employ of the Brighton and Hove Gas Company, The Gaslight and Coke Company, and the Turkish Government. He had examined the patents referred to in the prospectus of the British Water-Gas Syndicate.

Mr. Danckwerts: In 1889, when the prospectus was issued, was water gas being produced on a large scale by other processes than Fox's?

Witness: Certainly.

Has the water gas produced by Fox's processes any advantages over that made by other systems?—Not that I am aware of; and I have paid special attention to the manufacture of water gas. I was an Engineer to The Gaslight and Coke Company; and I know what was being done there. I first knew of water gas produced in this country in 1890. By itself water gas has practically no illuminating power; and this led to its being carburetted. When water gas is used in connection with the magnesium comb, the comb becomes incandescent and gives off light.

Assume the Fox patents to be valid for the purpose of the question I am about to put. Is the process described or covered by the Fox patents for the production of water gas one which—either in price, in manner of production, or for any other reason—is commercially cheaper than water gas produced by the other systems to the extent of giving Fox's processes a practical business monopoly?—I do not think the patents mentioned by Fox confer any such advantages.

With respect to the water-cooled ring, what are the advantages attaching to it?—I am not aware of any.

Is it used at all with the generator with the vertically parallel sides?—In the most successful generator, no such appliance as the water-cooled ring is used.

Cross-examined by Sir E. Clarke: He had manufactured water gas at a good many places—at Beckton, among others. He began to be concerned in the manufacture of water gas in 1890. That was water gas produced for carburetting for illuminating, and was with plant of the Lowe base patent of 1873.

Sir E. Clarke: Is it a fact that water gas gives the most intense heat known?

Witness: Water gas has a flame a little hotter than coal gas; but the heating power is a little less.

For welding a cylinder, is it not a greater heat than anything known?—It has a greater flame temperature. I have never been to the Leeds Forge, and know nothing of the works there.

You have studied the prospectus, will you point out anything that is untrue in it?—There is a passage at the bottom of the first page with which I should certainly differ in opinion—"which will place this Company in a position not only to command the market for water-gas plant, but will also enable them to supply generators, furnaces, &c." As I read this phrase, the prospectus says it would give the Company a preponderating influence on the market. I do not see anything else in the prospectus to which I can take exception.

Mr. *Corbet Woodall*, M.Inst.C.E., M.I.M.E., examined by Mr. Danckwerts, said he had for over thirty years devoted a good deal of attention to the construction of gas-works and questions relating to the supply of gas. He had assisted numerous gas companies and corporations owning gas-works.

Mr. Danckwerts: You have a thoroughly practical experience?

Witness: Yes. I have read the prospectus of the British Water-Gas Syndicate; and I have to some extent looked into the patents mentioned therein.

Besides the processes for the manufacture of water gas referred to in the patents, were there in 1889 many others known?—There were. In the year 1889, I became acquainted with the manufacture of water gas. I visited America in the autumn of that year; and I previously saw experiments conducted at Beckton. A system was introduced which was called Meese process; and afterwards the Springer apparatus was put in. In the autumn, Mr. Trewby and I went to the United States; and we saw a good deal of water-gas making. I had other business; but Mr. Trewby went to see water-gas plant in operation.

The Gaslight and Coke Company have been making water gas since 1889?—Yes; and they used it for illuminating purposes. It was carburetted water gas that they employed—that was to say, water gas enriched by petroleum. They have made it continuously since 1890; but they were at work on *quasi* experimental works from 1889.

Comparing Fox's processes with others, do you say that they had any advantage over other patents?

Sir E. Clarke objected.

Baron Pollock thought the question a very wide one.

Mr. Danckwerts: What do you say with regard to the statement in the prospectus that the Company would be in a position to command the market?

Witness: I know nothing in the history of this Company to justify the expectation that they would be able to command the market for water-gas plant and machinery; and the association of the names of Wilson and Dawson seem to be misleading—seeing that the application of these two inventors had nothing to do with water gas. If the Water-Gas Syndicate had been able to command the exclusive use of the Lowe plant, which was in a somewhat modified form shown in the diagram on the wall of the Court, on the whole they would have been in a position to command the sale of the most improved water-gas plant. If they had had the exclusive right to the use of this system, they would have had what I regard as the best system for making water gas. Fox's system is a simple adaptation of Lowe's improved water-gas plant; and the claim in the prospectus would have been fair if they had the exclusive right to the Lowe plant. I add this, because I do not quite understand what is meant by the Fox system. What I found was that the process was much in use in the United States, and had been for years; and that consequently it was published in England from the patent of Lowe in 1874.

You say, as a practical man, that the process was in use in the United States?—Yes. There was no application of the Lowe process in England till 1890 by The Gaslight and Coke Company. I acted on behalf of the American Company erecting the plant. They had no licence from the British Water-Gas Syndicate, and never thought of applying for one. Witness further said that the statement in the prospectus in reference to the Fahnehjelm comb was distinctly misleading. Water gas manufactured at a cost of 4d. per 1000 cubic feet, including all contingencies, could not be used as an illuminant. The paragraph conveyed the erroneous idea to the general public that water gas made at a cost of 4d. per 1000 cubic feet was equal in light-giving power to coal gas.

There is a statement that water gas can be used in connection with the Fahnehjelm comb, and has all the conveniences of coal gas?—That is not true. The comb involves a considerable amount of cost to the user. In 1891, Lowe's process was used not only by The Gaslight and Coke Company, but in Copenhagen; while it is now being introduced in Belfast, Birmingham, Manchester, Birkenhead, Swansea, and at least twenty other towns.

What do you say as to the water-cooled ring?—It is unnecessary; and it was introduced here because the producer was not a good one.

Is there any difference in water gas produced by Fox's process and that made by other systems?—I see no reason why the composition of the gas should be different.

Sir E. Clarke: Had you anything to do with writing these libels?

Witness: Certainly not; and I have only been consulted in this case since March of this year. I have no interest beyond being a scientific witness.

Before 1889 water gas had been largely used in America?—Yes; but I do not remember reading the reports in the "Journal of Gas Lighting." I am not aware that in one district of Brooklyn £60,000 was paid for the right to use the Lowe patent.

Was there, to your knowledge, a very large Company with a capital of nine millions?—I do not know. I had nothing to do with companies.

So far as it had achieved a great success in America, it was in connection with the Lowe patents?—No; there were a considerable number of methods by other inventors.

The expectation which was expressed, that the Syndicate would obtain the command of the market for water-gas plant, was not realized?—That is so.

There are very many expectations honestly made that are not realized?—No doubt.

Do you suggest that they were untrue statements to the knowledge of the man who made them? Do you say it was a mistake or a lie?—Having regard to the general nature of this prospectus, I think there was such culpable negligence that it approaches the untruth.

Point out any statement in the prospectus which is untrue in fact?—The statement with regard to the command of the market for water-gas plant. That was an untrue statement of fact.

The prospectus which contained this expression, gave references to all the patents which the Company were going to use; and therefore put it in the power of anyone who knew anything of the subject to turn to the patents.—Yes.

Mr. Wilson was a very well known gas-furnace engineer of the highest repute?—In the special branch of making producer gas, yes. Permit me to say that the general statement includes the opinion that the prospectus was intended to convey the idea that there was a monopoly in the hands of the promoters.

Is there any statement to that effect in the prospectus?—What is to "command a market," but a monopoly?

Surely there is a great difference?—It does not say anywhere that it would be impossible for other people to manufacture.

Since 1890, water gas has been used somewhat extensively in this country?—It has, and it has proved a commercial success. But it is not the water gas referred to in the prospectus. There is a difference between carburetted and pure water gas. I have no experience of pure water gas as used at the Leeds Forge.

Is it true that before 1889 experts knew that water gas was a failure?—Certainly not.

It is not true that "everybody knows it now"?—No; because in the States it was used for lighting. I have had nothing to do with water gas for metallurgical purposes.

Mr. *W. H. Y. Webber*, chief of the editorial staff of the "Journal of Gas Lighting," examined by Mr. Bigham, said he had to look after the preparation of notices and criticisms in the "Journal" connected with matters in the manufacture and distribution of gas. He had written many articles on gas and its production.

Mr. Bigham: Are you personally acquainted with the history of water gas?

Witness: Yes. I remember in 1889 the Water-Gas Syndicate being brought out; and the scheme was the subject of considerable public criticism. It was criticized severely in the "Journal" at the time.

Have you examined the processes by which it was proposed to produce water gas by the Syndicate?—I have not been to the Leeds Forge; but I have been through a number of specifications purporting to cover Fox's processes.

From whom did you get the specifications?—I have never had them in my possession; but Mr. Scudder, Mr. Fox's Manager, put them before me. Mr. Scudder came to the office of the "Journal," and said that he was very much annoyed at the tone of our hostile criticism. He brought a bundle of specifications; and we went through them together.

What do you say to the statement that the Company were in a position to command the market?—It is certainly not accurate. I still adhere to the reasons I gave in April, 1889. The manufacture of water gas was perfectly well known at the time. It may have been possible, of course, to have brought out something which would have built upon the general

idea which would have rendered it more valuable than it was before; but I failed to find anything to show that this had been done. I did not say what the future might be; but there was no reason for anyone to go to Samson Fox, or the Water-Gas Syndicate, to pay a penny if he wanted to make water gas. My interest in the matter was chiefly with reference to the presumption that water gas as made by the Syndicate was going to enter into competition with ordinary coal gas for lighting purposes; and this I did not for a moment believe possible, because water gas, however little it might cost, could not possibly be used for illuminating purposes without something being added to it. I think the statement as to what was the actual cost of pure water gas into the holder is utterly beside the mark. It ought to have been at the burner; and I certainly saw in the prospectus a misleading blinking of this question.

Have you gone into the relative cost of ordinary coal gas at Leeds?—At Leeds they were charging 1s. 10d. per 1000 cubic feet at that time.

Sir E. CLARKE said he had no question to ask witness.

Mr. *Woodall* was recalled by Mr. BIGHAM, to prove the cost of coal gas at Leeds at the time the prospectus was issued. He said the cost of gas to the Leeds Corporation, as delivered into the holder, was 1s. 1d. per 1000 cubic feet. As it was delivered to the consumer, it cost close upon 1s. 5d. per 1000 cubic feet. The cost of annuities and interest was 5d. per 1000 cubic feet.

Mr. BIGHAM: The cost of 4d. per 1000 cubic feet for water gas was on the premises?

Witness: That was the cost of a non-illuminating water gas on the premises; but that is a very different price if it had to be delivered, and allowance made for the cost of annuities, &c.

In order to make water gas an illuminant at all, it is necessary to have the assistance of the comb?—Yes; and there is also the cost of distribution to the consumer.

If it was being used at the Leeds Forge, the cost of distribution would be outside the question?—Yes.

With the comb, does water gas give as satisfactory a light as coal gas?—I believe not; but I have never seen it.

Sir E. CLARKE: The Leeds Forge had to pay 1s. 10d. per 1000 cubic feet for their coal gas. That price was extremely low, was it not?

Witness: Yes. The price was low in Leeds.

In London, at the same time, it was 2s. 3d. per 1000 cubic feet?—Yes; but the cost of production was under 12½d.

Mr. BIGHAM then read the evidence of Herr Kuppelweiser, given in the Notts and Derby action. This gentleman was Manager of Rothschild's works at Witkowitz.

The further hearing was then adjourned till Monday (yesterday).

The Incandescent Gas-Light Company's Patents.

In the Chancery Division of the High Court of Justice last Tuesday, Mr. Stewart Smith renewed a motion for the release of one Benjamin from prison to which he was committed on March 23 for breach of an injunction granted against him in respect of an infringement of the patents of the Incandescent Gas-Light Company. Mr. Terrell, Q.C., for the Company, complained that the defendant, though he had had the whole of the vacation to file affidavits, had only given copies on the previous day. He should ask for leave to cross-examine the deponents, because the sale of the mantles was still going on. Mr. Justice Romer said he would dispose of the motion now. He felt inclined to let the defendant out; but he would have to pay the costs. If he sold the mantles again, or was concerned either directly or indirectly in dealing in them, he could be re-committed; and, if he were, he would not get out of prison so easily. Mr. Smith having read a portion of defendants' affidavit in which he apologized for his contempt of Court, and promised not to offend again, his Lordship ordered his release, and also that he pay the costs of the motion.

Last Saturday, Mr. Justice Romer had before him a motion for judgment against the Morning Sunlight Gas Lighting Company, which came on as a short cause, no defence having been put in; and the usual order was made. Mr. Scott appeared for the plaintiffs. Similar orders were made in eight other cases; the names of the respective defendants being: Edwards, the Unrivalled Incandescent Lighting Company, J. Dowle and Sons, Kipping, Smythe, the Star Incandescent Company, the Apollo Incandescent Gas-Light Company, and Guldman.

Similar proceedings are being taken in other quarters, for we learn that the Supreme Court of New South Wales has granted to the Australasian Incandescent Gas-Light Company a perpetual injunction against Mr. E. A. Turner, an importer of incandescent burners and mantles into the colony. Judgment was obtained by reason of the evidence of numerous experts before a Commission recently held in London by order of the Supreme Court of New South Wales.

Hardman and Holden, Limited, v. Lockwood and Co.—A Gas Tar Contract.

At the Manchester Sittings of the Chancery of Lancashire, last Tuesday, Mr. Sutton and Mr. Maberly appeared for the plaintiffs in support of a summons that the defendants (who were represented by Mr. Grant) should be required to furnish further and better particulars of their defence. It appeared from the statements of Counsel that the action was brought to enforce specific performance of an agreement under which the defendants undertook to supply the plaintiffs for a considerable number of years with 4500 tons yearly of gas tar produced at the Rochdale Road gas-works of the Manchester Corporation. The defendants had delivered one year's supply, and then refused to make any further deliveries. The plaintiffs alleged that, in consequence of this refusal, they would be very seriously injured, as they were unable to obtain the gas tar anywhere else, and would not be able to carry on their works. The defendants, in their statement of defence, said that there had always been a market for the gas tar. They also alleged that the plaintiffs were not beneficially entitled to the contract, but were merely the nominees of the Tar Distillers' Association and transferred the tar according to the directions received from the Association. The Association was, the defendants said, an illegal Association; and in carrying out its objects, the members were guilty of a criminal conspiracy. The defendants further alleged that they were induced to enter into the contract on representations which were untrue. The plaintiffs now urged that, having regard to the nature of the defence, it was absolutely essential that the defendants should be required to give further particulars of the matters upon which they relied. After hearing Counsel on both sides, Vice-Chancellor Hall ordered the defendants to furnish particulars of the directions of the Association under which they alleged that the plaintiffs transferred the gas tar to others, and also as to the alleged untrue representations upon which they said they had entered into the contract. His Honour declined to order defendants to state the markets in which the tar could be obtained.

The Conveyance of Gas Lime in Open Barges.

At the North London Police Court on Monday last week, Mr. D'Eyncourt gave his decision in a prosecution undertaken by the Hackney Vestry against a number of barge owners of Ware, for carrying gas lime on the River Lea in uncovered barges and during prohibited hours. Mr. Eldridge appeared in support of the summonses; and Mr. Hughes defended. Hitherto the gas lime has been removed from the gas-works as soon as the barges were filled, and taken along the Lea to country towns, where it was disposed of as manure. Mr. Leo Taylor, Public Analyst for Hackney, Mr. Otto Hehner, and other analysts gave evidence as to the noxious character of the refuse. It was stated that it was most offensive, and that the health of persons who inhaled the odour was likely to be endangered. On the other hand, witnesses were called (including Mr. Coble, the Clerk to the Lea Conservancy) who said that once the peculiar odour became familiar, it was positively liked, and that it was usually considered very good for children with whooping cough and colds generally. Mr. D'Eyncourt said, in the face of this evidence, he had to satisfy himself by seeing the barges and smelling their contents. He saw the gas lime fresh from the purifiers, and other gas lime that had been out a week or two; and he came to the conclusion that, although the smell was certainly not very pleasant, there was nothing offensive or noxious about it. He therefore dismissed the summonses, with £8 8s. costs against the Vestry.

Another Charge Against a Gas Collector.

At the Westminster Police Court last Tuesday, Frederick William Jones, late collector for The Gaslight and Coke Company in the Hoxton District, and Secretary of the Company's Outdoor Workmen's Provident Fund, surrendered to a warrant (which has been in existence since last October) charging him with embezzlement and misappropriation. Mr. C. O. Humphreys, who prosecuted for the Company, said the prisoner had held a very confidential position, and had been in receipt of a salary of £350 a year. In addition to the charges of embezzlement and falsification of accounts which the Company preferred, he would be charged with misappropriating £645 from the workmen's provident fund of which he was Secretary. Sergeant Bowden gave evidence of the prisoner's surrender, accompanied by his Solicitor, who said that there would be an answer to the charges. Mr. Tonkin, for the accused, applied for bail. Mr. Sheil (the Magistrate) said he should not listen to such an application. Prisoner was remanded in custody.

Theft by Boys from a Prepayment Meter.

At the Guildhall, Nottingham, last Thursday, Samuel Hayes, William Sullivan, and John Leighton were charged with stealing 7s., the property of the Nottingham Corporation, on the 17th inst. Prisoners all pleaded guilty. It was stated that 51, Clare Street, a house taken over by the M., S., and L. Railway Company, contained a prepayment gas-meter. Prisoners were seen by a labourer leaving the unoccupied premises; and, on investigation, the meter was discovered to have been seriously damaged. The index showed that it contained 7s. 3d. Of this amount only 3d. was found on opening the meter; and the lads were ultimately arrested. Sullivan, who had been seven times convicted and twice birched, was ordered to be sent to a reformatory school for three years. Hayes and Leighton were fined 30s. each, or fourteen days' imprisonment in default.

Opening of New Water-Works for Worthing.—The new water-works which have been constructed by the Worthing Corporation were formally opened yesterday week by the Duke of Cambridge, amid much local rejoicing. The new source of supply is at the base of the downs, about two miles to the north of the borough and near to Cissbury—an ancient earthwork. A spacious reservoir, with an actual capacity of 2 million gallons, lies a little to the north; and the total extent of ground comprizing both reservoir and pumping-station is 3½ acres. The walls of the reservoir are very solidly constructed; being built of layers of concrete, asphalte, and hard brick. The engines, which will be used alternately, are individually of about 87-horse power; each engine and set of pumps being capable of raising 1000 gallons of water per minute to a height of 215 feet. Remote though it is from the habitable portion of the district, extreme precaution has been taken to prevent the contamination of the water in the well. The shaft, which has been sunk into the chalk to a depth of 119 feet is cased with flanged iron shields in segments; the joints being vertically made of pitch pine and horizontally of yarn and Russian tallow. Headings to increase the supply have been driven to a length of 150 feet. Present appearances seem to show that there is a practically unlimited yield. On the point of purity some excellent results have been obtained. With the expenditure upon the present scheme the Corporation have incurred an outlay exceeding £100,000 in restoring the sanitary condition of the borough. On arriving at the engine-house, the Duke started both engines, naming one the "Victoria" and the other the "Cambridge." During the proceedings, a brief description of the works was read by Mr. Mansergh, jun., son of the Engineer; and subsequently the Mayor entertained a distinguished company to luncheon at the Town Hall.

MISCELLANEOUS NEWS.

BUENOS AYRES (NEW) GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held last Tuesday, at No. 1, East India Avenue, E C.—Sir WILFORD BRETT, K.C.M.G., in the chair.

The SECRETARY (Mr. E. W. Layton) read the notice of meeting; and the Directors' report and the accounts for 1896 were taken as read.

The CHAIRMAN said the statement of accounts showed an improvement in the result of the Company's operations. They had a profit of £54,511; being an increase of about 20 per cent. over that of the preceding year. To this profit must be added the balance brought forward of £3533. After payment of the debenture interest, which amounted to £12,000, and charging against revenue the cost of sundry improvements and alterations on the works and property, and other sums, amounting in all to £7054, there remained £38,990 to be dealt with. Of this £15,000 had already been paid to the shareholders as an interim dividend; and the Directors now recommend that a final dividend of 6s. per share (or £15,000) be declared—making 6 per cent., free of income-tax, for 1896. After transferring £5000 to the reserve fund, they had an amount of £3990 to be carried forward. The profit would have been greater, but for the increased taxation, which now amounted to 6½d. per 1000 cubic feet of gas sold, which the shareholders would readily recognize was a very heavy item. They would be glad to know that the works had been maintained in very good order during the past year; and their Consulting Engineer (Mr. S. Simmelkjör), who had recently been out to Buenos Ayres, and had had the opportunity of personally inspecting the works, was perfectly satisfied with them, and reported that the statements as to their condition were not exaggerated. During last year, the Directors sanctioned an extra expenditure in overhauling the service-pipes; and they had, as a result, considerably reduced the leakage. As a matter of fact, they had saved 19 million cubic feet of gas, or 1800 tons of coal, the men's wages in producing this quantity of gas, the fuel, and wear and tear. Thus in one year they had absolutely saved the whole cost of the revision of the services, not to speak of the permanent benefit in the future. The work had been carried out with great energy; and it had proved this fact, that most of the leakage was from the service-pipes and not from the mains, which, he was happy to say, since they were overhauled by Messrs. Aird and Sons, were in good condition. The unaccounted-for gas last year was 9½ per cent., as against 14½ per cent. in 1895. The oil-gas plant had been working satisfactorily. They had now two oil-tanks erected, and proposed to add a third, so as to give them ample accommodation for all the oil required. They had also added to their coal storage capacity, and were now able to store a full six months' supply under cover. Those who had had any experience of gas making knew what an advantage this was as compared with leaving the coal to deteriorate in the open air. The Company had had some expense to meet owing to the Municipality having raised the level of the roads adjoining the works, which necessitated the raising of the levels and floors in the works; and from this there was no escape. In August last they had to contend with a strike of the men; and this might have been very serious for the gas-making interests of Buenos Ayres. Happily in their own case, they were able to smooth matters over, and to bring things to their normal state, chiefly, he thought, through the energy and influence of Senor Bustamente, the assistance of the Local Committee, and the attention given to it by the members of the staff. It was very gratifying that it had ended as it had done, as otherwise it might have been a grave matter. Turning to the credit side of the accounts, the total public and private gas-rental showed greatly in favour of 1896 over 1895—to the extent of some 12 per cent. The increase in meters for the year was 411; and the public lamps were augmented by 229—the total number now lighted by the Company being 7711. He was pleased to say the bad debts were decreasing year by year; and they were really 30 per cent. less than in 1895, which spoke well for their collectors. The sales of residuals had increased by about 7 per cent. The tar products had sold very well. They had disposed of their entire production of tar for the year; and they had also arranged for the full sale of it during 1897. From the residuals, they had got back 40 per cent. of the cost of the coal, as against 35½ per cent. in 1895—in fact, the sale of residuals for the past year was the best they had had since the Company came into existence 22 years ago. On the whole, the receipts increased by about 6½d. per 1000 cubic feet; while the expenditure was only augmented by 3d. Therefore the profit was 3s. 1½d. per 1000 cubic feet. English companies were often quite satisfied with a profit of 9d. per 1000 cubic feet; so he thought in this respect they had no ground for complaint. The causes which had been most favourable in bringing about this result were the reduction in leakage, the saving of cannel, and the improved distribution. The freights for coal had very much stiffened; but, with the improved sale of residuals, a further reduction in leakage, and careful management, he did not think it would make much difference to the Company. The result of the working he thought the shareholders would consider very satisfactory. It showed them that, with good management and careful supervision, a gas company at the present time had not much to fear from the electric light. The debentures bearing interest at the rate of 6 per cent. would fall due on Jan. 1, 1898; and the Board proposed to replace them by the issue of debenture stock at a lower rate of interest. A great sadness, he also remarked, had overclouded the year by the death of Mr. Wanklyn, whose loss they keenly felt. He was a trusted member of the Local Committee in Buenos Ayres. The Chairman concluded by proposing the adoption of the report.

Mr. F J. HESELTINE (the Managing Director) seconded the motion.

Mr. W. S. CUFF expressed satisfaction with, and congratulated the Directors upon, the report. The Chairman, he said, had stated that the profits made per 1000 cubic feet were 3s. 1½d.; and he would like to ask whether this was the sterling value realized, or was it affected by the present rate of exchange. He also asked whether the Company were doing anything to forward incandescent gas lighting in Buenos Ayres.

The CHAIRMAN replied that the 3s. 1½d. was the sterling value. With regard to incandescent lighting, there were many different opinions concerning it; and even at home, it was not universally used. The Board had under consideration as to how far the light might be useful in Buenos Ayres; and they would adopt it immediately there was a prospect of its being acceptable to the inhabitants.

The motion was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. J. C. IM THURN, a dividend of 6 per cent., less the 3 per cent. already distributed, was declared.

The retiring Directors (Messrs. Im Thurn and R. Nesham) and the Auditors were re-elected.

Mr. R. L. ANDREWS moved a vote of thanks to the Chairman and the Directors, to the Local Committee, and to the staff in London and Buenos Ayres.

Mr. S. SPENCER, in seconding the motion, said he should like to ask whether the proposed amalgamation of the Belgrano and Argentino Companies was likely to affect the interests of this Company.

The CHAIRMAN said he thought it was the opinion of the Directors that it would not. He also acknowledged the vote of thanks.

The proceedings then terminated.

THE COMPETITION IN GAS SUPPLY OF BUENOS AYRES.

Projected Fusion of the Belgrano and Argentino Companies.

Last Tuesday, an Extraordinary General Meeting of the Belgrano (Buenos Ayres) Gas Company was held, at Winchester House, Old Broad Street—Mr. C. P. OGILVIE presiding—for the purpose of considering, and, if thought expedient, ratifying an agreement between the Company and the Argentino Gas Company for the sale of their respective properties to a new Company.

The SECRETARY (Mr. H. T. Adkins) having read the notice convening the meeting,

The CHAIRMAN said in November last year the Directors sent a circular to the shareholders intimating that they had formed the basis of fusion between the Company and one of the other large Gas Companies of Buenos Ayres; and on April 17 they were able to send out the actual agreement that had been entered into. Calling attention in the first place to the history of the Belgrano Company, he said that the Municipality granted concessions for making gas to various Companies; while the city could well have been supplied by one. He was unable to say what their reasons were for giving so many concessions; but it had occurred to him that they thought, by so doing, they would be able to create severe competition, and keep the price of gas as low as possible. He could assure the shareholders that, from the Directors' point of view, every energy had been exercised to reduce the price of gas. The cheaper they could produce it, and the less they could charge the consumers for it, the better for all concerned. In 1891, the shareholders appointed him (the Chairman) as a Director; and shortly after he visited the River Plate. On arriving at Buenos Ayres, one could easily see that a great error had been made in granting the supply of gas to several Companies. In some of the streets, there were four different sets of mains, which meant four times the leakage of gas, and the opening of the streets four times, instead of once, for laying and repairs. If a consumer in a street containing four mains quarrelled with the Company for charging him a certain price for gas, he would say: "It does not matter, there are three other Companies who will supply me." So the competition went on. In 1891, he spoke to various gentlemen who were highly interested in the supply, and started the idea of some sort of amalgamation or fusion; but he was met with the remark that it was utterly impossible. However, he saw that, sooner or later, amalgamation must come. In 1894, he again visited the River Plate, and repeated his views; and he was encouraged to this extent—that most of the people to whom he then spoke admitted that amalgamation would be a good thing, but would be very difficult to carry out. He should like to mention how he came into touch with the Company with whom they were now proposing to amalgamate. It was not, he should first explain, an amalgamation in the ordinary sense of the word. Both Companies were proposing to sell themselves to an entirely new Company. It was to be an English Company, formed with English capital, and having their offices in England. He would not have advised the shareholders to sell the concern to a Foreign Company. Some years ago, a question arose between the two Companies, as to whether the Belgrano Company had accidentally tapped one of the Argentino Company's mains. This was an incident that might crop up at any time, and with any of the Companies. Honestly he did not know whether any gas was then taken from their main; but there was the possibility of it. The Argentino Company brought an action against them; and the Directors—he thought wisely—settled it. Thereupon a friendship arose between the two Companies; and this friendship was the foundation-stone of the step the Directors were laying before the shareholders that day. Dealing with the position of the Belgrano Company, he said it was not many years ago that the Directors had to face the shareholders and tell them that, not only was there no dividend, but they had to begin the year with a large loss. Year after year they gradually wiped away this loss; and then they came to the position of being able to pay a dividend, which had increased regularly. For years they did not receive the dividend which had been earned, simply because the money which might have been distributed had to be expended on new mains and works, though in this way their position was strengthened. Last year they had to spend no less than £18,000 on capital account. He did not say that this would all have been distributed to the shareholders by way of dividend; but he did say that it was a serious break in the progress of the Company to take such a large amount out of the revenue, and put it into mains. Since 1891, they had spent the round sum of £68,000 in increasing the works. At one time there were five Companies in the city; but the Argentino Company bought one of the larger works. The Belgrano Company had to drive gas no less than nine miles before it reached their last consumer; and in many of the streets there were three or four mains, which was an utter waste of capital. He was told that, if the amalgamation was carried out, they would be able to take up something like 30 miles of mains without damaging a consumer. The Chairman proceeded to speak of the necessity of improving the supply to the district of Flores; and

reverting to the question of competition, he said it was a blot that, month by month, one of the points in their reports should be that they had lost so many consumers, and had received so many new ones, which was probably simply a "swop" between the Companies. They had hitherto been on the right side in this respect; but it was a position that ought not to exist. He thought the shareholders would derive a great deal of benefit by doing away with the competition. They could not go on expending money in the way they had been doing, though he believed it had been judiciously laid out. The results showed that for the last five years they had improved their position; but it was utterly impossible for them to go on year after year without asking the shareholders or the public for further money. Their capital was £200,000; and the debentures, £100,000. How could they go and borrow? Any borrowing that took place must be detrimental to the present shareholders. They would do wisely to trust the Directors, and to believe that they had advised them rightly in this matter. Having mentioned that the Argentino Company were holding a meeting that day to consider the question, he alluded to the directorate of the new Company. The Local Committee would consist of Senor Meliton Panelo, the Chairman of the Argentino Gas Company, Senor José Toso, the Chairman of the Belgrano Local Committee, and Senor Ernest Tornquist—a name well known in the River Plate. The Directors on this side would be: Messrs. H. G. Anderson, A. E. Bowen, C. J. Hegan, A. T. Hooper, C. P. Ogilvie, and A. le Rossignol. Mr. Bowen, who had been a Director of the Argentino Company for many years, would be the first Chairman. The new Company would not commence business in a pauperized condition. They would have upwards of £100,000 of working capital; and therefore the shareholders would not be called upon to enlarge that at present. He had been asked whether there would be a balance dividend for 1896. If the scheme was carried out, the Belgrano Company would have ceased to exist from Dec. 31, 1895. The shareholders had received 2½ per cent. on their share capital from the earnings of 1896; and part of the agreement was that both Companies should receive a total dividend of 7 per cent. for the year, and though actual figures were not yet to hand, he felt sure there would be a satisfactory amount to place to reserve or to use for other purposes. He wished to put another picture before the shareholders. If they did not agree to the amalgamation, he did not think they would get anything beyond either an additional 2½ or possibly 3 per cent., as they would have to put a large amount to reserve, besides having certain heavy sums to write off. He had heard it said that this fusion ought not to be carried out. Supposing some of the other Companies—their competitors—happened to think that fusion between themselves would be good business, the Belgrano Company, being comparatively a small one, might possibly get squeezed. In regard to their share in the new Company, there would be £25,000 beyond the present share capital to distribute among the shareholders; so that possibly they would get £11 in the new Company for every £10 in the present one. Of course, they had their employees to consider in the event of them not getting engagements with the new Company; so he did not bind himself in this respect. When, however, they finally wound up, there would be a distribution of some sort or other. He moved the confirmation of the agreement.

Mr. HEGAN, in seconding, said there were four important points to consider in favour of amalgamation. There would be a great saving in working expenses; a great relief from competition that was ruinous in the extreme; they would be able to show a much stronger front to the Municipality, at whose hands they had suffered considerably at times; and they would be relieved of the necessity of finding further capital for extensions.

Several questions were asked, the nature of which will be gathered from the Chairman's reply.

Mr. R. NESHAM, a Director of the Buenos Ayres (New) Gas Company, stated that he had had an opportunity of consulting a gas expert (who had recently returned from Buenos Ayres) in regard to the proposed amalgamation; and he assured him that it would be a beneficial arrangement, and that the terms were very good indeed for the Belgrano Company.

The CHAIRMAN, in reply to questions, said the combined Company would occupy ground over which the city must extend; and the Argentino Company now distributed gas in the centre and busiest portion of the city. The capital of the latter amounted to something like 6,000,000 paper dollars; but the shareholders must not run away with the notion that the paper dollars were of gold value. It meant something between £1,200,000 sterling and £400,000, which gave them plenty of margin to work upon. There was a standard charge for gas; but it was subject to fluctuating discounts. There were no concessions for the supply of gas. The total capital of the new Company that would be distributed among the present shareholders of the two Companies would be £850,000; and a small issue might be made for Stock Exchange purposes. The earnings of the Argentino Company in 1893, after paying debenture interest, were £21,000; in 1894, £31,000; and in 1895, £46,000. He believed the earnings of the combined undertaking this year would be nearly £80,000; and in two years they should be £100,000.

Mr. HEGAN: The percentage on their total capital last year was 10·46, as compared with 4·75 in our case.

The motion was unanimously adopted; and a vote of thanks to the Chairman and Directors concluded the proceedings.

SOUTHWARK AND VAUXHALL WATER COMPANY.

A Special General Meeting of this Company was held last Tuesday, at the Offices, Southwark Bridge Road, to consider the Company's Bill in Parliament to increase the quantity of water which they may take from the Thames. Alderman Sir HENRY E. KNIGHT presided.

The SECRETARY (Mr. Montague Watts) having read the notice calling the meeting,

The CHAIRMAN stated that, though the object upon which they had met was very important, yet it was very simple; and he should therefore only have to detain them a few moments. In the Act of Parliament of 1852, the Company, as they had always maintained, were authorized to take such quantity of water from the Thames as was necessary for supplying their district. But after the passing of this Act, an agreement was entered into between the Company and the Thames Conservators—the latter being, he thought, afraid that the quantity of water which the Company might take would interfere with the navigation of the river. The arrangement they entered into with the Thames Conservators was to pay that body £300 per annum, and not to take more than 20 million gallons of water a day. In 1884, a further agreement was entered into with the Conservators, under which the Company agreed to pay them £1000 a year, and to take up to 24½ million gallons of water. The Directors had always contended that these agreements did not interfere with the Act of Parliament of 1852, which they held authorized the Company to take as much water as they wanted for the supply of their district. The matter was often referred to in Parliament—in the different Bills of the Company, and also at other times—but no action was taken, and no question was formally raised respecting the rights of the Company. The matter, however, assumed a very serious aspect when they found it was necessary for them to take from 30 to 36 million gallons of water daily for supplying their district; and the Thames Conservators naturally raised the question respecting which they had previously said there was some doubt. They contended that if the Company wanted more than 24½ million gallons, they must go to Parliament for sanction to take more water; and they also stated that the Company would have to pay the Conservators something more than they did at present for the additional water they might take. The Company were well advised, and they still contended, that they were right in their view that they were justified in taking an extra quantity of water from the Thames. An action was, however, brought against them by the Thames Conservators; and it was tried before Mr. Justice Mathew, who decided against the Company. The case was well and ably argued; and they did not think it well to appeal against the decision of the learned Judge. They were therefore placed in this position—that the Court had decided that they were only to take 24½ million gallons, whereas they wanted a considerable increase upon this quantity. Under these circumstances, it became necessary at once to promote a Bill in Parliament, in order that they might obtain the necessary powers to take an increased quantity of water, because Parliament decided in 1884 that, without their consent, the Water Companies should not take any additional quantity from the Thames. This was their motive in going to Parliament now; and it was incumbent on them to do so, in order to obtain the powers they required. The Thames Conservators, too, had no authority to give the Company more water without the consent of Parliament. They were going to Parliament in cordial agreement with the Conservators; and, as far as the Directors could judge, they did not think there was any doubt that Parliament would give them the powers they were so righteously asking for—especially when it was remembered that the quantity of water in the Thames was so abundant that ample could be taken for the requirements of London, no matter what these requirements might be, provided that sufficient storage was reserved to tide over the dry season. He might inform them that in times of flood enough water went over Teddington Weir in one week to supply the whole of London for an entire year, if there were sufficient storage for it. There was no question as to the quantity of the water; and there was no difference in its quality, as this matter had been enquired into by eminent Commissions and reported on in the most favourable manner. They had made arrangements with the Thames Conservators as to the terms on which the additional water should be taken; and these were satisfactory both to them and to the Directors. He thought that when they had obtained the Royal Assent to the Bill, they would have made another step forward in the policy which they had found it necessary to pursue for some years, in order to keep the Company in this splendid position, and well abreast of any requirements likely to arise. He concluded by moving the following resolution: "That this meeting, having considered the Bill introduced into Parliament in the present session, intituled 'A Bill to increase the quantity of water which the Southwark and Vauxhall Water Company may take from the River Thames,' approves thereof, subject to such additions, alterations, and variations as Parliament may think fit to make therein, and as the Directors shall approve."

Mr. C. M. VIALLS seconded the resolution.

The CHAIRMAN, in reply to Mr. Carlile, stated that the terms which the Company were giving to the Conservators for the additional water they proposed to take from the river were set out in the Bill; and the arrangement bound the Conservators as well as the Company. The Conservators approved the terms; but, of course, the matter rested with Parliament. They would have to face the opposition of the London County Council, as usual; but they had met this successfully up to now. They did not anticipate any further opposition. Petitions had been presented against the Bill by various authorities who thought that their interests might be affected; but these were protests such as they always met with in these cases. They were asking for powers to increase their take from the river from 24½ to 45 million gallons a day. After this maximum was reached—which, however, would not be within any appreciable time—they would have to go to Parliament again.

The resolution was carried unanimously, and the proceedings ended.

ANTWERP WATER-WORKS COMPANY, LIMITED.

The Annual Meeting of this Company was held last Friday, at the London Offices, Nos. 96-98, Leadenhall Street, E.C.—Mr. DAVID EVANS in the chair.

The SECRETARY (Mr. J. M. Hamilton) having read the notice calling the meeting, the report was submitted. It stated that the income from all sources amounted to £35,334, as compared with £31,799 for 1895; and after deducting the expenses, there was a balance of £21,785. To this was added the undivided profit of £347; making a total credit of £22,132, against which had been charged debenture interest and income-tax for 1896, the contribution to the reserve fund of 5 per cent. on the net profits, and the interim dividend of £6000. There was then left for distribution £13,293, out of which the Directors recommended that a balance dividend for the six months to Dec. 31 last be paid at the rate of 4 per cent. per annum, absorbing £6000; that the sum of £4700 be transferred to the sinking fund; that the reserve account be supplemented by £2149 (making it £7500); and that the balance of £444 be carried forward.

The CHAIRMAN, in moving the adoption of the report, said he thought

the shareholders would agree with the Directors that it was very satisfactory both in respect of the increase in profits and the sale of water. It would be seen that the Directors had resolved to supplement the reserve fund by £2149; and so strengthen the position of the Company. They were continuing to increase, though not at the same proportionate rate as last year, when things were very favourable. This year they were having a wet season; and consequently there was not the same demand for an increased supply of water that there was last year.

Mr. W. Blaber seconded the motion.

The Chairman, replying to questions, said he did not think their capital was small for the size of the Company. They were not desirous of increasing it, unless they could get altered conditions from the town. They had made certain proposals with regard to an extension of the concession; and they were hopeful that something would be done this year. The Directors felt certain that, if the municipality would only unite with them in developing the water-works and the supply, they would both benefit materially. Some exception was taken to the stocks in which the funds were invested; but the Chairman pointed out that, if the money was invested in stocks which did not return so large a rate of interest, a greater sum would have to be put to the amortization fund each year.

The motion was unanimously adopted.

The retiring Directors and Auditors having been re-elected, and the usual complimentary vote passed, the proceedings terminated.

BLACKPOOL CORPORATION GAS SUPPLY.

An Excellent Year's Working.

At last month's meeting of the Blackpool Corporation Gas Committee, the Gas Engineer, Mr. John Chew, presented his annual report on the working of his department. In it he showed that for the twelve months ending March 25, there was a marked increase on the consumption of the previous year. Whereas in the year to March, 1896, the make of gas was 280 million cubic feet, last year showed a production of 314 millions—being 34 millions additional. The unaccounted-for gas was only 1¼ per cent. on the make. More than 800 consumers were added to the list; and an increase of 200 18-candle lights was made in the street-lamps. Four miles of new and additional mains were laid; and 1200 yards of old mains were taken up and enlarged. A new station meter, for 80,000 cubic feet per hour, was erected; and considerable extensions and renewals of railway sidings were finished. New furnaces and condensers are in course of erection, to meet the demand expected for this next season. The amount expended during the year on capital account was £3445; bringing the total up to £106,290. Turning to the revenue account, it is seen that the price of gas was the same as last year—2s. 4d. per 1000 cubic feet net, with free meter. The total expenditure was £33,845 (£3000 more than the previous year); and the income from private consumers was £33,838, or an increase over the previous year of £3666. Street lighting cost £3736—an increase of £427. Coke did not do so well; lower prices prevailing. The receipts were £4799, against £4861. Tar did much better. With sulphate of ammonia, it brought in £4310, or more than £1000 above the previous year. These, with sundry payments, brought the total income to £47,979; being an increase of £5078 on the previous year's income. This left a gross profit equal to 13 per cent. on the capital employed in the works. Taking interest and sinking fund as absorbing £4889, and the renewal fund as requiring £1028, there would be left to be credited to the borough fund a sum of £8083—or £1800 more than the previous year—and £134 would be brought forward to the credit of the current year. The coals used amounted to 30,973 tons, from which 314,062,000 cubic feet of gas were produced. Of this quantity, 288,972,000 feet were sold to consumers, 19,871,000 feet were supplied to the public lamps, 1,523,000 feet were used on the works. This accounts for 310,366,000 cubic feet, and shows an amount for unaccounted-for gas of only 3,696,000 feet, or equal to 1·18 per cent.—probably the lowest record of leakage in the United Kingdom. Alluding to these results, a local paper says: "Mr. Chew must be warmly congratulated upon the splendid return from his well-managed department. Whatever may be the facts concerning other branches of the Corporation, he will be a bold man who dares impeach the management of the Blackpool Gas-Works."

The Dangers of Unventilated Gas-Geysers.—The peril of using unventilated gas-geysers was illustrated in a lamentable manner last Saturday week. On that day, Mary Elizabeth Hammond, age 25, a teacher of cookery at the Lambeth National Schools, was found dead in a bath-room at 15, Cranbrooke Mansions, South Lambeth Road; and the cause of death was disclosed at an inquiry by Mr. Walter Schröder, at the Lambeth Coroner's Court, last Tuesday. Mr. T. Hammond, a bank clerk, identified the deceased as his sister. On Saturday morning she did not call him as usual; and, in consequence of what the servant said, he went to the bath-room. Being unable to make the deceased hear, he burst open the door, and found his sister lying on her back undressed. There was a strong smell of gas; and water was running into the bath from a geyser, which was only fitted the previous day. The atmosphere was oppressive; and the window was closed. In reply to a Solicitor, who appeared for Messrs. Biggs, of Borough Road, the fitters of the geyser, witness said his sister, as a teacher of cookery, was well acquainted with the use of gas. On the previous night, she had distinctly told him that the bath-room could be used before the ventilating funnel was put in the ceiling. It was by her instructions that the geyser was fitted. Elizabeth London, the servant, said her mistress told her on Friday not to touch the geyser, as it was dangerous. Dr. James Miller, who was called in, stated that the young lady was quite dead. Although the door had been opened, the heat of the room was most oppressive. Death was due to heart failure from the density of the atmosphere. Mr. H. Pharo, Manager to Messrs. Biggs, spoke of a conversation he had with the deceased, who said she was aware that the geyser could not be used until the room was ventilated. The work was not to be completed until the Saturday or the following Monday. The funnel was to carry off the products of combustion, and was absolutely essential. The Jury returned a verdict of "Death by misadventure."

THE NEW RETORT-HOUSE RULES AT THE LEEDS GAS-WORKS.

Taking into consideration all the circumstances, the arrangement arrived at between the Leeds Corporation Gas Committee and the men who went out on strike on account of their dissatisfaction with the new code of rules which the Committee wished to apply to the two machine-worked retort-houses at the New Wortley station was perhaps the most sensible that could have been adopted; and it was put into operation at the beginning of last week.

At six o'clock on Monday morning, the men resumed work, in order to be able to test the practicability of the new regulations; but it was soon clearly evident that the contentious spirit was not entirely absent. Previously the men had denied that the 300 retorts in the house where West's machinery has been introduced could be properly looked after with a staff of twenty-one men per shift—four machinemen, eight firemen, and nine attendants. More attendants, they contended, were necessary. However, they determined to test the matter; and if their experience confirms the opinion that a larger staff is desirable, they will no doubt make some representation to the Gas Committee on the subject. Monday of last week was an unfortunate time for starting the experiment. Gas-making had been discontinued on Sunday; and during the night the tar in the ascension-pipes had hardened, and the first shift had to undertake the task of clearing them. Apart from the complaints that were heard from the men during the day concerning the character of the work they were called upon to do, there was dissatisfaction expressed respecting other matters. The application of the new code of rules necessitated the reduction of the staff of machinemen, firemen, and attendants from 26 to 21 per shift. To the management, of course, was left the duty of deciding what men should be kept on. That those who received notice should regard the choice of the management as unwise, is not surprising. But the men urged another cause of complaint. They called the attention of the Works Manager (Mr. Bond) to an unwritten law between the Gas Committee and the leaders of the men at the termination of the strike in 1890—that, in the case of letting down retorts and reducing the number of workers employed, preference should be given to those who had been in the service of the Corporation the longest. The men say that this rule has not been strictly carried out in the present instance. They point, for example, to two yardmen who stuck to their work during the strike. The Committee, it is urged, have rewarded these men for their loyalty by keeping them on, although, according to rule, they ought to have received notice.

With this spirit of discontent apparently rife among the men, it is not surprising that operations at the New Wortley works on Monday did not go on quite as smoothly as was hoped; nor were the management altogether satisfied that the men were doing their best to get through the work smartly. The second shift of men were able to perform a fair amount of work. The regulations stipulated that there shall be eight draws per shift; and they accomplished seven. The third shift, however, succeeded in doing the whole of the labour required.

So far as could be learnt, everything proceeded satisfactorily during the remainder of the week. On Friday afternoon, the Gas Committee, accompanied by Mr. Townley, the General Manager of the department, visited the works; and Messrs. Smith and Wood (Secretaries of the Gas Workers' Union) and two of the men were also present by invitation. The men at work in the retort-house had commenced their shifts at two o'clock; and it was their second draw which the Committee witnessed. Promptly at three o'clock, a start was made; and, at the end of thirty-five minutes, the whole range of retorts had been drawn and re-charged. This was regarded as a fair average performance—at any rate, it enabled the men to rest for twenty-five minutes before they had to repeat the operation on the next set of retorts—one set being dealt with each hour. It was mentioned in the course of the afternoon that the draw during the week was satisfactorily accomplished in twenty-eight minutes; and members of the Committee argue that this is proof that the new rules are just and equitable. The men assert that the rules are not being worked as strictly this week as they were prior to the recent dispute; and it is understood they admit that, if the management are willing to proceed on the present lines, there will be less cause for dissatisfaction. The questions at issue will in all probability be further discussed at a conference to be held during this week.

On Sunday last, a labour demonstration was held in Leeds; and presiding at one of the platforms was Mr. J. E. Smith, the District Secretary of the Gas Workers' Union. Addressing those present (most of whom were members of the Union), Mr. Smith said they would expect him to make some reference to the dispute at the New Wortley works; but it was not his intention to say one word to aggravate the present position of affairs. They were to have another interview with the Gas Committee during the week; and nothing ought to be said which would prevent an amicable settlement. The "Journal of Gas Lighting" said they were fighting against the introduction of machinery; but that was an absolute falsehood. They did not object to the introduction of machinery. What they said was that the men who had charge of the machines should not have to work harder than they had to do under the hand-stoking system. The men would prefer hand-stoking to machine-stoking under the conditions adopted by the Leeds Corporation. The men had gone back under the new rules; but it must be understood that they were not working strictly to those rules. He did not think that either the Gas Committee or the gas workers desired a repetition of the gas strike of 1890; and he was sure the public did not. Neither the Corporation nor the gas workers could withstand public opinion; and though some people might think the men's officials had not acted so strongly as they might have done, it was their duty to try all reasonable means before having recourse to anything so drastic as a strike. One of the other speakers was Mr. Connellan (a member of the City Council), who expressed the opinion that some of the new rules which the Committee had proposed to impose on the men condemned themselves. Resolutions were passed, calling upon workers of Leeds to join their Trade Unions, expressing the opinion that the time had arrived when an eight-hour day (or 48 hours per week) should become the law of the land, and hoping that the present Government would pass the old-age pension scheme.

A LARGE GASHOLDER FOR HALIFAX.

Opposition to the Site—The Necessity for Additional Storage Proved.

The minutes presented by the Improvement Committee at the last meeting of the Halifax Town Council referred to a suggested diversion of a new road to Whitegate, in view of the contemplated erection of a gasholder on a portion of the site of the road at Stoney Royd; and it was stated that it had been resolved that the making of the road should be proceeded with on lines originally laid out. The adoption of the minutes having been moved,

Alderman WOODHEAD, the Chairman of the Gas Committee, proposed as an amendment: "That it be an instruction to the Improvement Committee to divert the new road to Siddal, so as to admit of a new gasholder, 203 feet in diameter, being erected at Stoney Royd." In doing so, he said the Gas Committee wished the Improvement Committee to divert the new road for a distance of some 65 feet, so as to enable the Gas Committee to erect the holder in question. That they needed increased storage capacity at the gas-works, the Council well knew. The Gas Committee themselves were made painfully aware of the fact last winter; for, in consequence of the deficient storage capacity, and the demand for gas made upon them, they were in the unfortunate position of having to request the largest consumers to restrict their demands as much as possible during the period of difficulty. The minimum reserve capacity should equal a maximum day's output. Their daily output was 4,400,000 cubic feet; but the storage capacity was only 3,561,000 feet. To remedy this deficiency, the Committee thought the provision of the proposed holder on this site would be the most economical course that could be adopted. It had been suggested that one of the present holders should be increased by three lifts (at a cost of over £9000), and thus increase the storage capacity to 4,852,000 cubic feet; but this would only give them relief for a year or so. The Committee, therefore, deemed it inadvisable to make the alteration. The proposed new holder, however, would have a capacity of 5,700,000 cubic feet; and it would serve them for ten or twelve years to come. Proceeding, he pointed out that the total cost of the Siddal site, in addition to the diversion of the road, would be £6520; whereas, if they were driven to erect the holder elsewhere, he estimated that the cost would be £28,520. Moreover, if they did not utilize the land at Siddal on which they intended to erect the holder, it would be practically worthless. Some members of the Council also looked with a little suspicion on the amount of gas it was expected they would make in the future. He might say that in 1880 the maximum day's output was only 2,000,000 cubic feet; while in 1896 it was 4,400,000 feet. There were some other members who might think that the Gas Committee were spending money rather fast. (Hear, hear.) To those who cried "Hear, hear," he would like to submit the following figures: The capital expenditure per million cubic feet of gas sold was in 1870, £999; in 1875, £969; 1880, £819; 1885, £613; 1890, £517; and 1896, £460. It would therefore be seen that the capital expenditure had come down from £999 in 1870 to £460 at the present day.

Alderman BROOK seconded the amendment.

Mr. H. E. GREENWOOD asked what effect a 150 feet holder, instead of a 203 feet one, would have upon the diversion of the road. Also, what effect did the Chairman expect the introduction of water gas would have upon the production of gas in the future?

Alderman WOODHEAD replied that a gasholder of the size mentioned would only mean 10 or 15 feet difference in the site. A small holder would moreover be very uneconomical. As to the other question, if the Corporation made water gas, they would decidedly require somewhere to put it.

Mr. BALDWIN did not think the consumption of gas would increase in the same ratio as in the past; and moreover he understood the Committee were putting down plant which would produce about a million cubic feet of water gas per day. Water gas could be obtained very rapidly, and in a measure was equal to a gasholder. He therefore thought the most satisfactory way to proceed would be to enlarge one of the existing holders by adding three lifts.

Mr. H. E. GREENWOOD considered it would be a rash act to sanction the spending of nearly £50,000 in connection with the gas-works in view of the probable effect that water gas and electricity would have upon gas consumption in the future.

Mr. T. GREENWOOD pointed out that water gas could not be produced immediately; and therefore it was necessary to have storage capacity. The electric light in other towns had not affected the consumption of gas to any large extent. The Gas Committee, in their proposed additions, were only estimating an increased consumption of 5 per cent.; and he did not think they would fall far short of that. His experience during the last four or five years was that the consumption had increased more than 6 per cent.

Mr. HEBDEN pointed out that the proposal to remove the site for the gasholder to some other part of the town would necessitate a very serious outlay.

Mr. BOTTOMLEY said the fact that the Gas Committee were unanimous on this matter ought to have some weight with the Council.

Some of the members having declared that the erection of the holder on the site in question, which is in front of the fever hospital, would be detrimental to the health of the patients and others,

Dr. W. C. F. SMITH said he inclined to an opposite opinion; and the Gas Committee ought to be supported in their scheme. Even when diverted, the road would be 100 yards away from the hospital.

Dr. WEST SYMES objected to the scheme because the divergence of the road would bring it nearer to the hospital; and in spite of what Local Government officials had said in regard to the matter, he was still of opinion that the farther the fever hospital was away from the road, the better it would be.

Alderman GAUKROGER, the Chairman of the Improvement Committee, admitted that the figures presented by Alderman Woodhead were very important; and he was rather in a fix as to the way he should vote, for he was getting convinced that the Gas Committee were in the right after all. If the Committee were prepared to accept all responsibility in connection with the erection of the holder, he would give his vote in favour of the holder being erected on the site proposed.

The amendment was then carried by a large majority.

THE WATER GAS AGITATION.

Further Objections Raised at Liverpool.

Surgeon-Lieut.-Colonel Cayzer, who has lately gained for himself some measure of notoriety by his determined opposition to the supply of water gas by the Liverpool Gaslight Company and his communication to the "British Medical Journal" (*ante*, pp. 765, 789), has returned to the attack in the columns of the "Liverpool Daily Post," which paper has been particularly to the fore in giving publicity to alarmist views on the subject. Two letters appeared last week from Lieut.-Colonel Cayzer; and as they are intended to controvert a statement in the report on the subject which Mr. T. O. Paterson, the Gas Engineer of the Birkenhead Corporation, presented to his Committee, we give the principal portions *in extenso*.

The opening paragraphs of the first communication were as follows: "In January of this year, Mr. T. O. Paterson, M.Inst.C.E., the Gas Engineer at the gas-works, Birkenhead, courteously forwarded to me a copy of his report to the Corporation of Birkenhead, dated Jan. 20, 1897. In it, he said (speaking of Boston, Mass., U.S.A.): 'With reference to the repeal of the law in this State, a petition signed by 223 Boston physicians, in their joint capacity as gas consumers and physiological experts, concluded with the statement—It is no more dangerous to health and life than coal gas; and there is no just ground, as far as health and life are concerned, to prohibit its manufacture.' I did not make any observation at the time, as I do not put pen to paper for your columns or those of any other organ of the Press until I can give chapter and verse for what I write, much astounded as I was at such an opinion as that of my American brethren some few years ago. In this same city of Boston, this year, the case is as follows (I quote the "Engineering Record" verbatim): 'Dangers of Water Gas.—The dangerous properties of water gas as compared with coal gas, which was a live question fifteen or twenty years ago, when the gas companies in the large cities began to change their systems of manufacture from the old retort system to the Lowe water-gas system, is now under discussion in Boston, U.S.A.; and reports on the subject have been submitted to the Legislature by the Committee on Manufactures. It appears that the number of deaths in the city of Boston resulting from the inhalation of gas has greatly increased in recent years, the figures being as follows: In 1893, 23; 1894, 26; 1895, 22; and 1896, 43. The consumption of gas has increased over 43 per cent. in three years, notwithstanding the great increase in the use of electric light. The majority report says that this increase in gas consumption is due to the decrease in its price, consequent upon the reduction in cost made by the use of the water-gas process; that the increase is chiefly in the tenement-house districts and among the poorer classes; that the increase in the number of deaths is due to the increased use of gas; and that in almost every case the fatal result was due to suicide, drunkenness, carelessness, or ignorance. The minority report says that the increase in the number of deaths is due to the substitution of water gas for coal gas; that it was a mistake in 1890 to allow the manufacture of water gas, which mistake it was easier then to make than it is now to remedy. The minority of the Committee, believing that prohibition of the manufacture of water gas is now a practical impossibility, suggest the passage of an Act to compel the operation of the existing coal-gas plants in Boston, and the mixing of the coal gas with the water gas, so as to reduce the carbonic oxide in the mixture to below 16 per cent., and prohibit the distribution of gas containing a higher percentage of carbonic oxide. So much as regards Boston in 1897. Before me lies the February number of the "International Medical Magazine," published in Philadelphia, U.S.A. Dr. H. Cattell, one of its three Editors, writes as follows: 'There seems to have been recently in Philadelphia an epidemic of accidental and suicidal deaths from illuminating gas. During 1896, the coroner held inquests on 33 cases in which death was determined to have been directly due to this cause. It is often impossible to state positively whether the act has been premeditated; but one-half of the cases would seem to be intentional.' He goes on after a few sentences to say: 'Water gas is largely used in Philadelphia; and death in these cases is due to poisoning by carbon monoxide, as it forms one-third of the volume of this variety of illuminating gas. The uniform rosy hue of the serous membrane of the small intestines is one of the most striking features of the autopsy. The odour of the other gases inhaled at the same time as the carbon monoxide is often incapable of recognition at that time. The best test is that of the spectroscope. It is stated in the daily papers that a Bill is to be introduced into the present Legislature of Pennsylvania to use carbon monoxide for executing criminals condemned to death. The person to be carbonoxided is to be kept in ignorance of the date of execution, while the gas is to be given to the patient by turning it on noiselessly in a specially-prepared room. While there might be but a small amount of physical suffering, the mental torture of the uncertainty of the date of death would be terrible.' So much as regards Philadelphia in 1897. Of course, to say that fatal results from carburetted gas are due to 'suicide, drunkenness, carelessness, or ignorance,' is another way of saying that human beings are all fallible, and too many are wrong-headed."

In his second letter, Lieut.-Colonel Cayzer said: "Since I last wrote you, the report of the Massachusetts Board of Gas and Electric Light Commissioners relating to 1896 has come to hand. Under the head of 'Accidents' the Commissioners remark: (1) During the past year, the attention of the Board was called to 67 different instances of escaping gas, which resulted in the death of 51 persons and injury to 118 others. (2) The Board feel it their duty to call public attention to this increase in the number of accidents from illuminating gas. Many are undoubtedly cases of suicide; and while others may point that way, a closer examination tends to show that some of them were more likely due to imperfect fixtures. (3) A broken main in a Boston street filled a whole block of buildings with gas, which killed one child and partially asphyxiated nearly 100 persons of all ages. (4) The instances of people found dead in bed with a single unlit burner left wholly or partly open are startlingly numerous. (5) Generally the first intimation given of the state of affairs was the strong smell of gas emanating from the room, which goes to show that the odour does not alarm the victim. Only a dozen cases occurred out of Boston."

ELECTRIC LIGHTING NOTES.

The Hull Corporation Electric Lighting Committee last Thursday accepted several tenders, amounting together to £35,206, for carrying out extensions of the electric lighting works that were recently sanctioned by the Council.

After the unmistakable declaration of the feeling of the ratepayers of Newmarket, during the recent District Council election, on the question of the proposed application for an Electric Lighting Order, the new Council could not do otherwise than take steps to cancel the proceedings of their predecessors in the matter. This they did at their first meeting, held yesterday week, when a motion that the application be abandoned was carried by seven votes to five.

The Dorking District Council have agreed to transfer their Electric Lighting Order to a local Company, which Edmundsons, Limited, are to form and provide capital for. The expenses incurred in obtaining the Order and transferring it to the Company, are to be repaid to the Council. The latter are to have the right of purchasing the works at any time after three years, upon giving twelve months' notice in writing; the price to be the capital expended *plus* 15 per cent.

The President of the Newcastle-on-Tyne Association of Students in connection with the Institution of Civil Engineers (Mr. J. B. Simpson) is very sanguine as to the grand future which lies before electricity as a lighting and working medium; and last week he told the students the one thing requisite to bring about the displacement of gas from its position of being the most useful and popular of lighting agents. He said the weak point in electric companies was the want of motors to use their current during the day. These motors would become to electric supply companies what the residual products were to gas companies. There was no doubt that, before many years passed by, there would be electric tram cars in Newcastle; and electric motors of all kinds would be supplied. No doubt gas companies would do all they possibly could to cheapen the cost of the production of gas; and the electric supply companies would have to do all they could to compete with them. So far the Newcastle Companies had done very well to compete with gas at so low a price as 1s. 10d. per 1000 cubic feet. This showed what could be done. If they could have means of storing electricity in a somewhat cheaper way than was at present known, gas would be no more used for lighting houses!

The accounts of the St. Pancras electric lighting undertaking for the year ending Dec. 31 last have been submitted to the Vestry; and they disclose a large loss on the new King's Road station. The old Regent's Park works produced a revenue of £23,133; and the net profit, after meeting all charges, was £2816. A balance of £1149 was brought forward from 1895; so that the total profit to the credit of this station on Dec. 31 last was £3965. The King's Road station accounts, which cover a period of fifteen months, show the big loss of £4766. The net result of the working of the two stations is put down as a loss of about £800; but it must not be overlooked that the balance from 1895 has been taken into the calculation. The consumers connected with the Regent's Park station now number 530; and the incandescent lamps fixed, 21,511. There are also 151 arc lamps on the system, and 44 motors. The number of consumers on King's Road station is 143; and of incandescent lamps, 4912. During the year there were 1,442,815 units supplied from the combined stations, of which the public lighting required 183,686. The loans which the Vestry are authorized to borrow amount to £200,000; and the capital expended is rapidly approaching this sum —the total at Dec. 31 last being £187,138.

Notices of motion are on the *agenda* for to-day's meeting of the Birmingham City Council to the effect (1) that it be an instruction to the General Purposes Committee to consider and report as to the desirability or otherwise of the Council purchasing the undertaking of the Electric Supply Company, Limited; and (2) that a Special Committee of the Council be appointed to confer with the Directors of the Company, in order to ascertain if they are willing to transfer, by agreement, the undertaking to the Council, and, if so, the terms upon which such transfer could be made. The "Birmingham Gazette," commenting on the matter, says: "It is being suggested that the Corporation of Birmingham should buy up the electric lighting plant and rights now existing within the borough. There should never have been any need for such a step as this; but during the past few years, the Corporation have lost all grasp of really big questions, and accordingly a private company have been permitted to acquire valuable interests. Roused from their lethargy by the crushing exposure of municipal folly in connection with the tramways question, some of our city fathers are now beginning to recognize that if the supply of electricity is left much longer in private hands, the task of purchasing it will be greater even than a wealthy Corporation can face with equanimity. We advised municipalization at the outset, and we are still in favour of the principle; but there must be very careful investigation and valuation before any definite steps are taken."

At the meeting of the Newington Vestry last Wednesday, a long report was received from the Electric Lighting Committee, showing the present situation of the fight for municipal electric light in the district. The document is a long one; but it may be summed up by saying that it is a protest from beginning to end against the action of the Board of Trade in postponing their decision on the question of granting the Vestry an Electric Lighting Order. The grounds on which the Board had delayed their decision were "the serious objections" which had been lodged on behalf of a large number of ratepayers; but the Vestry assert that the signatures to the petition containing these objections were obtained by canvassers and members of the Moderate party in opposition to the elected Progressive representatives returned by the parishioners at the general election in 1894, and to the majority of nearly two Progressives to one Moderate returned at the May election in 1896. In the last paragraph of the report, the Vestry urged that there should not be any further delay in the Order being submitted to Parliament for confirmation; and in the event of it not being confirmed this session, the Clerk was instructed to give the requisite statutory notices of the intention of the Vestry to proceed during the session of 1898 by means of a Private Bill "for securing the parish the powers sought by the Provisional Order, in consequence of the Board of Trade failing to carry out the spirit of the Electric Lighting Acts, 1882 and 1888." The Committee's recommendations, after two amendments had been proposed and rejected, were carried by 42 votes to 9.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners, on Monday, fixed their contracts for coal, lime, and general stores for the year. Of coal, they have contracted for 87,500 tons for the Edinburgh works, at an average price of 10s. 9·4d. per ton, as compared with 93,000 tons, at an average price of 10s. 3d. per ton, a year ago, and 105,000 tons, at an average price of 12s. 5·2d. per ton, two years ago. For the Leith works, they have contracted for 50,500 tons of coal at an average price of 10s. 8·4d. per ton, as compared with 49,000 tons, at an average price of 10s. 8¾d. per ton a year ago, and 45,000 tons, at an average price of 11s. 3·12d. per ton, two years ago. There is thus a very slight increase in the average price of the coal. But there is this to be noted, that for the Edinburgh works the quantity of first-class cannels has been increased from 1000 to 11,000 tons. Along with this, there is, however, to be taken into account the fact that, whereas a year ago as much as 18s. 3d. per ton was paid for the first-class cannel, this year the highest price is 16s. 8d. per ton. There is not the same fall in the price of the other coals; and the circumstance of the first-class cannel being so much down would seem to point to a disposition to use more of the less rich cannels. As a matter of fact, the two first-class cannels are new on the list; and consequently comparison cannot be made. But the prices indicate that they are not of the same quality as those which were ordered last year. Of the second-class, or shaley cannels, the quantity contracted for is 29,500 tons, compared with 30,000 tons a year ago; so that they remain about the same. It is in the third-class, or inferior cannels, that the reduction in quantity chiefly takes place; the decrease being from 27,000 to 15,000 tons. When the values are considered, they work out thus: If the whole of the coal contracted for were delivered, the cost of it would amount to £47,031, as compared with £42,662 under last year's contracts. The first-class cannel would cost £8900, as compared with £1150; the first and second class cannels together would cost £26,600, as compared with £19,775; and the first, second, and third class cannels together would cost £34,412, as compared with £35,750. These are features of the contracts which are noteworthy, on account of the reason which, I presume, underlies the change. Carburetted water gas will soon be made in the Edinburgh works; and the enrichment to be obtained by it enables the Commissioners to dispense with the highest class of cannel, and the bulk of gas to be produced by it enables them to do with 5500 tons of coal less. But while the highest class of cannel is excluded, and the total quantity of coal contracted for is 5500 tons less, the cost will be £4300 more than under last year's contracts. The cost of oil, which apparently is not yet contracted for, has to be added to this. According to the calculation, the result of introducing carburetted water gas would be that the materials to be carbonized would cost more than coal alone would. But then it must be remembered that the whole of the coal contracted for will not be required; and according to the quantity and cost of the undelivered coal, will be the benefit from enrichment by carburetted water gas. Still, on the other hand, when it is considered that the output of gas from the Edinburgh works has increased during the current year by about 50 million cubic feet, and that it is considered advisable to contract for 5500 tons of coal less, there does not appear to be much likelihood of coal being left over. There will doubtless be, in the working of the process, economies which will be appreciable; but, in truth, the estimates which have been proceeded upon do not seem to have been framed on the footing that much saving was to be effected. For the Leith works, the contracts do not show the same variation. Were all the coal contracted for delivered, the total cost would be increased from £26,286 under last year's contracts, to £26,891. For the Portobello works, 4000 tons of coal have been contracted for, at 11s. 10·8d. per ton. The lime contracts are: Edinburgh, 5000 tons, at an average price of 11s. 6·3d. per ton, as compared with 11s. 5·1d. per ton a year ago; Leith, 2740 tons, at an average price of 11s. 7·1d. per ton, as compared with 11s. 5d. per ton; and Portobello, 180 tons, at an average of 10s. 7·3d. per ton.

The newspaper correspondence over the introduction of carburetted water gas into Edinburgh still continues. Singular to say, it is all on the one side. The subject was referred to this week at meetings both of the Gas Commission and the Town Council. At the former, Mr. Hunter asked if it would not be as well to print Professor Crum Brown's report, so that the public might have the benefit of his opinion on the subject. Lord Provost M'Donald remarked that it was upon this report that the Commissioners acted, after they had taken the trouble to understand all about it. Bailie Kinloch Anderson said he thought the suggestion of Councillor Hunter was a good one. He would like the public to be assured that they had not taken the step without carefully considering the matter. They had been very largely influenced by the report of Professor Crum Brown. The subject dropped, without any arrangement being made. In the Town Council, Mr. Mackenzie, the Convener of the Electric Lighting Committee, introduced it. He called attention to the report by Professor Vivian B. Lewes to the Birkenhead Corporation, published in the "JOURNAL" last week, in which it was stated that already there was 11 per cent. of carbon monoxide in Edinburgh gas, and that about 16 per cent. was the utmost limit that ought to be allowed in carburetted water gas; so that they could only add 4 or 5 per cent. It was a serious matter; and he would like the Corporation to look into it. The Lord Provost said that the subject was causing a good deal of talk. Probably a Coal Syndicate had something to do with it. But they had got a new Gas Manager, whom they had instructed to look very closely into the matter; and he had no doubt it would come all right. Mr. Mitchell Thomson suggested that the question was one which the Public Health Committee should take up. If there were nothing wrong, the public should be re-assured; and an assurance coming from the Town Council would be very much more effective than any statement coming from the Gas Commission. I have since been informed, on high authority, that Professor Lewes was wrong in his figure of 11 per cent. But I have looked up, and have before me, the report by Professor Crum Brown, in which it was stated that the result of four tests of Edinburgh gas was to show that carbonic oxide was present in the percentages of 10·8, 9·6, 11·0, and 10·8 respectively; and appended to this report is one by Mr. J. Stenhouse, Chemist in the Edinburgh works, which showed 9·6 and 9·8 per cent. of carbonic oxide. These figures are not much below 11; but then

there is the conclusion which Professor Crum Brown came to, that in round numbers they might say that Edinburgh gas averaged 11 per cent. of carbonic oxide. Professor Lewes thus has authority for his statement. Unless this percentage can be reduced, there is only 5 per cent. which it would be safe to add. I see that Professor Crum Brown allows 17 or 18 per cent. of carbonic oxide, in which case there would be 6 or 7 per cent. to be added. Mr. Herring, the Engineer, has the matter under consideration; and the public may trust to his doing right. As yet they have shown their confidence in him by not getting disturbed by the alarmist letters that are being published.

Among other matters which were before the Gas Commission on Monday, was the approval generally of the principle of a superannuation scheme, on the footing: (1) That the scheme should be optional on the part of present officials and workmen, and obligatory on new ones; (2) that there should be an optional retiral from service at the age of sixty, with power, however, to continue service beyond that age; and (3) that the annual contributions of members should be 2½ per cent. of salaries and wages, and that the Commissioners should annually give an equivalent amount. The Committee also resolved to crave a recommit, with the view of consulting an actuary on the financial aspects of the scheme.

The Treasurer, Mr. James Fleming, submitted to a meeting of the Sub-Committee on Finance of the Glasgow Gas Trust, on the 28th ult., a statement regarding the collection of gas and electric lighting rents up to date. There had been received in the shape of gas rents a sum of £345,125 12s. 7d., against £341,789 17s. 8d. at the corresponding date of last year; so that there was an increase of £3335 14s. 11d., even with the reduction of 2d. per 1000 cubic feet in the current financial year. He also stated that the electric lighting rents for the current year amounted to £23,359 15s.; whereas at the corresponding date of last year the receipts amounted to £19,807 0s. 8d.—thus showing an increase of £3552 14s. 4d. The statement regarding the sale of residual products up to March 30 last showed that there had been received £100,160 13s. 3d., as compared with £102,464 8s. 1d., at the same date of last year. There was thus a decrease over the ten months amounting to £2303 14s. 10d.

The Gas Committee of the Dundee Town Council have this week opened the tenders for the supply of coal to the gas-works. The tenders have been remitted to a Sub-Committee to tabulate; and they will be before the Committee again next week. Though they have only been looked at cursorily, enough has been seen to indicate that the price of coal will be 2d. or 3d. per ton higher than last year.

The Dunfermline Corporation stock was subscribed for more than twice over. It is to bear interest at 3 per cent. The allotment took place this week; and the premium offered averaged £2 10s. Many did not go beyond the £2 minimum. All local investors who offered £2 were preferred to the others. In this way, the gas undertaking is made very largely to belong in reality to the local community. The Commissioners have reduced the price of gas for cooking, heating, and motive power from 3s. 7d. to 2s. 11d. per 1000 cubic feet.

The Stirling Corporation Gas Bill is to be before a House of Lords Committee the week after next; and if the objectors obtain *locus standi*—which I do not expect they will—the hearing may last two days. It is stated in a local print that the process of withdrawing their names, by those who signed the petition against the Bill, still goes on; but that another journal, in which the opposition get support, has informed those who withdraw that they may still be found liable in expenses. This shows that local feeling is still high.

A new water supply for the burgh of Troon, in Ayrshire, was turned on yesterday by the Duchess of Portland. The Duke of Portland is Lord of the Manor. The new works have cost about £18,000. Mr. W. R. Copland, of Glasgow, was the Engineer of the works.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *May* 1.

Sulphate of Ammonia.—The market has again been irregular; but still with a hardening tendency for immediate delivery—£7 12s. 6d. per ton f.o.b. Leith and Hull, and £7 15s. per ton f.o.b. Liverpool, having been realized. The demand for home consumption has continued good, absorbing most of the smaller makes throughout the country. There has also been considerable buying for "covering" April deliveries; and this has occasioned a further drain upon the larger makes, so that, on the whole, makers are fairly comfortable. London, deriving the least benefit from the home demand, is still the weakest point. Makers, for the most part, refrain from offering ahead, hoping for some improvement, and finding little inducement to sell at prices obtainable. Speculators, however, offer freely May-June delivery at below spot prices; and further ahead, at about the present level of values.

Nitrate of Soda is in good demand; but prices are barely maintained, owing to ample supplies. Quotations are 7s. 10½d. per cwt. for ordinary up to 8s. 1½d. per cwt. for refined quality.

LONDON, *May* 1.

Tar Products.—The market generally is quiet. A good deal of benzol is moving off; but the week closes with 90's at a lower price, while there is some appreciation in the value of toluol and 50's. Solvent and heavy naphthas are in fair request. The market for crude naphtha is, however, very flat. Heavy shipments of pitch are taking place; but the market is without feature in other respects. Creosote and tar oils are in better odour; and the value is slightly higher. Carbolic acid is firm, with a good deal of inquiry. There is nothing new to report about anthracene, of which there appears to be little or none offering. There are now no pressing stocks of anthracene anywhere.

Average values for the week are: Tar, 15s. to 20s. Pitch, 20s. to 22s. 6d. Benzol, 90's, 2s.; 50's, 2s. 4d. Toluol, 2s. 9d. Solvent naphtha, 1s. 7½d. Crude, 30 per cent., naphtha (naked), 1s. Creosote, 1⅛d.; liquid, 1¼d. Heavy oils, 35s. Carbolic acid, 2s. 6d. Pressed naphthalene, 57s. 6d. Creosote salts, 25s. Anthracene, "A," 7d.; "B," 5d. to 6d.

Sulphate of Ammonia is again in better request; and "bears" are busy covering good sales at present low prices. A better feeling prevails, especially as, with the now largely reduced production, it is found that no important stocks will exist at the close of the season. The value to-day is from £7 7s. 6d. to £7 10s., less 3½ per cent. at all ports.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—As perhaps an indication of what may possibly be the basis on which the large coal contracts for the ensuing season will be placed, it may be mentioned that one of the principal Lancashire Corporations has just ordered a quantity of ordinary gas coals at the prices which they paid last year. Colliery proprietors generally, however, as previously reported, still show a disposition to hold out for an advance of at least 3d. to 6d. per ton; and possibly something of this kind may be obtained on the smaller contracts. A great deal will, however, depend upon the course of the round coal trade during the next month or so. At present, the position remains fairly steady. Notwithstanding the depression in the iron market, the principal coal-using industries continue actively employed; and there is consequently a tolerably large consumption going on in the lower qualities of round coal. For the most part, pits have been enabled to keep on pretty near full time; but a slackening off in the demand for the better qualities is making itself felt, and in many cases four days per week is becoming the average. Here and there, rather than allow business to pass, collieries are willing to give way a trifle on recent quoted rates, but generally list prices remain unchanged, at about 10s. to 10s. 6d. per ton for best Wigan Arley; 8s. to 8s. 6d., for Pemberton four-feet and seconds Arley; 6s. 6d. to 7s., for common house coal; and 5s. 9d. to 6s. 3d., for steam and forge coals. Engine classes of fuel are in good demand—the present exceptional activity at the chemical works necessitating large requirements for slack; and with supplies not over plentiful, prices show a hardening tendency. But though some small advance has been talked about generally, average selling prices remain at about 3s. to 3s. 6d. per ton for common slack, and 4s. 3d. to 4s. 9d. for the better sorts. The business doing in the shipping trade is of fair weight, but only practicable at low figures. Ordinary steam coal still averages about 7s. 6d. to 7s. 9d. per ton delivered at the Mersey ports.

Northern Coal Trade.—There has been an increased demand for one or two classes of coal during the last few days; and the shipments to the Baltic will give activity to many of the chief of the shipping collieries. The demand for best Northumbrian steam coal is now very large; and with long loading turns at the chief pits, there is a rather higher price. Best steam coal is generally quoted at 8s. 9d. per ton f.o.b.; and it is probable that activity at these pits will continue for some weeks ahead. Second-class steam coal is 8s. to 8s. 3d. per ton; and steam smalls, 3s. 9d. to 4s. There is no alteration of moment in manufacturing coals. In regard to gas coals, there is a fuller demand, owing to the addition of the Baltic export trade; but the inland requirements are now naturally less. The price of best gas coals varies from 6s. 9d. to 7s. 3d. per ton f.o.b.; but in the case of one of the leading Durham collieries, which has heavy contracts, 3d. per ton above the highest figure named is asked for occasional cargoes. Gas coke is still in very heavy stock at some of the inland works; but the production is comparatively limited, so that there should soon be some decrease of the stocks in hand. There is no alteration in prices this week.

Scotch Coal Trade.—There is a large trade doing in all varieties of coal except splint, which is not in demand, and the prices for which are tending to droop. Main and ell are finding a good market, at prices which are improving slightly. The miners are working steadily and contentedly. The export trade is now in full swing, and is growing rapidly. The quotations are: Main, 6s. 6d. per ton f.o.b. Glasgow; ell, 7s. to 7s. 3d.; and splint, 6s. 6d. to 7s. The shipments for the week were 177,064 tons—an increase upon the previous week of 13,684 tons, and upon the corresponding week of last year of 27,237 tons. For the year to date, the total shipments have amounted to 2,160,477 tons—an increase upon the corresponding period of last year of 140,552 tons.

The Clayton Aniline Company, Limited, has been re-formed with a capital of £140,000 in £5 shares; the objects being to adopt and carry into effect an agreement for the acquisition as a going concern of the undertaking, business, properties, assets, and liabilities of the Clayton Aniline Company, Limited (incorporated in 1878), to develop and establish the same in such a manner as the Company shall deem expedient and generally to carry on all or any of their respective branches of the business of manufacturers of and dealers in benzole, aniline, and all products of coal and coal tar. The works are at Clayton, near Manchester.

The Salford Corporation Bill and the Out-Districts.—A conference of representatives of the Swinton and Pendlebury District Council and the Salford Corporation Gas Committee was held last Friday at Salford, to consider the clauses which should be inserted in the Corporation Omnibus Bill, now before Parliament, with a view to protect the district of Swinton and Pendlebury. After considerable discussion, clauses were agreed to embodying the abolition of the differential rate, the provision of a gas testing-station in Swinton, and the appointment of an independent gas tester. The District Council will now withdraw their opposition to the Bill.

Gas and Water Works Improvements at Ilkeston.—Colonel W. L. Coke has held an inquiry at Ilkeston relative to an application by the Corporation for power to borrow £6000 for water-works purposes and £1800 for improvements at the gas-works. The Town Clerk (Mr. Wright Lissett), in opening, stated that the loan required for the water-works had been modified to £1825. It was needed to enable the Corporation to proceed some 600 feet deeper if necessary with a borehole at Little Hallam, and to thoroughly test the supply before laying down permanent plant. Of this sum £1128 had already been spent. The last inquiry held in respect of the water supply was in 1889; and since then the population had increased from 19,500 to 23,000. They had then four pumping-stations, two of which had been discontinued. About half the present supply was obtained from the Nutbrook, about the quality of which there was a difference of opinion. It was imperative that the Corporation should obtain a fresh source of supply. Water was reached in the present borehole 827 feet from the surface; and it was hoped, by going down to the third millstone grit, that the present supply would be doubled. The analysis of the water showed it was of satisfactory quality for public use. The loan for the gas-works was chiefly required for the construction of new retort-settings on the regenerative system. Mr. F. C. Humphrys, the Gas Engineer, gave formal evidence regarding the latter; and the Inspector promised to report in due course.

Reduction in Price.—The Directors of the Dorking Gas Company announce that, from the taking of the meters in June next, the price of gas will be reduced to 3s. 9d. per 1000 cubic feet, with the usual discount for prompt payment, or 3s. 6d. net.

Much Wenlock Gas-Works.—The Much Wenlock Sanitary Committee have resolved to purchase the local gas-works from Mr. W. Lawley, on the report of Mr. William North, who considers they would be justified in giving £1500 for them. The Committee are asking for a loan of £2000, as the works require a little outlay upon them.

Gas-Works Extensions at Brighouse.—The Engineer of the Brighouse Corporation Gas-Works (Mr. James Parkinson) recently submitted a lengthy report on the question of extending and improving the Mill Lane and Birds Royd gas-works, at an estimated cost of £12,725. On the recommendation of the Gas Committee, the Town Council on Wednesday sanctioned the carrying out forthwith of several of the alterations.

Gas and Water Companies and the Repair of Public Roads.—The Lee District Board are sending a circular letter to Metropolitan authorities, stating that they have had under consideration the question of the damage caused to public roads and paths by being frequently broken up by gas, water, and other companies, and have urged the London County Council to include in their next General Powers Bill a provision to make it compulsory on the part of owners of house property to lay a pipe of sufficient size to carry communicating pipes from gas and water mains under the footpaths. The Lee Board ask for the support of other authorities.

Sale of Stock and Shares.—At Canterbury last Wednesday, £1000 of the new "B" stock in the Gas and Water Company was sold by auction at £23 to £23 15s. per £10 lot. This was issued by the Directors for the purposes of the water undertaking. On the same occasion £129 of "A" stock and £200 of "B" stock (privately owned) in the same Company changed hands at £46 to £46 10s. per £20 lot. Stock in the Tunbridge Wells Gas Company was sold by auction last Friday at a record price; beating the high figures secured a few weeks since. Lots of consolidated ordinary stock (which pays 11½ per cent.) sold at £280 per cent. Lots of £50 of consolidated "B" stock realized £110 each; and similar lots of "C" stock, £106. The competition for some 1878 debenture stock, paying 4½ per cent., was equally keen; the price given being at the rate of £120 per cent.

New Joint-Stock Companies.—The Ideal Gas Company has been registered with a capital of £1400, in £10 shares, for the purpose of acquiring and continuing the business of acetylene gas generator manufacturers, engineers, &c., carried on by Messrs. Whalley and Hacking, of Blackburn. Reeves' Chemical Sanitation, Limited, is a Company registered with a capital of £50,000, in £1 shares, to acquire certain English and French patents, and generally to carry on business as manufacturers of, and dealers in, chemicals and raw materials of every description, manure, sulphate of ammonia, and other products. Edmundsons' Electricity Corporation, Limited, with a capital of £200,000, in 35,500 ordinary and 4500 deferred shares of £5 each, has been formed for the purpose of purchasing the business of Edmundsons, Limited, engineers and electricians, at 19, Great George Street, S.W.

The Chester Corporation Sluices Bill.—The expenditure on the abortive Sluices Bill of the Chester Corporation (over which, it may be remembered, there was considerable local agitation) has involved an extra rate of 10d. in the pound, which will come out of this year's taxation.

Rosario Consolidated Water-Works Company.—The accounts of this Company show a net balance of £5187; and the Directors recommend the payment of the full dividend of 3 per cent. for the half year on the preference shares—leaving £1014 to be placed to the credit of the ordinary share dividend account.

Lambeth Water-Works Company.—The Directors of this Company have decided, subject to audit, to transfer £2000 to the contingency fund, and to recommend the payment of a dividend for the past half year at the rate of 9¾ per cent. per annum on the 10 per cent. shares and at the maximum rate on the 7½ per cent. shares, leaving a balance of about £1650 to be carried forward after making provision for the necessary payments on account of the sinking fund required by the Company's Act of Parliament.

The Recent Dispute at the Rotherham Gas-Works.—Several months ago, the stokers at the Rotherham Corporation Gas-Works were on strike owing to a dispute as to the terms of employment; and it was arranged that the matter should be submitted to arbitration. The men have lately held a meeting, at which it was proposed that, inasmuch as the Arbitrator, Mr. C. E. Rhodes, had so long delayed his award in connection with the dispute, notices should be handed in by the men to terminate their contracts. Mr. A. J. Bailey, of the National Amalgamated Union of Labour, suggested an amendment, which was carried, that the matter remain in abeyance until after a further meeting at an early date.

Bombay Gas Company, Limited.—In view of the plague in Bombay, the annual report of this Company has no doubt been awaited by the shareholders with more than ordinary interest. It shows that the Company have suffered, but not perhaps to the extent anticipated by many. "The rental from private consumers and meters," the report states, "shows an increase of £1076. This advance was maintained up to the end of September last, but then received a check by the outbreak of the plague in Bombay, since which time receipts from private rental have considerably diminished." The sales of residual products have improved. Higher rates of freight caused an increased expenditure on the coal carbonized, notwithstanding that the consumption was 693 tons less. The loss by exchange is £20,601, which is about £3620 less than that of the previous year, the whole of which has been charged to revenue. The balance brought forward from the preceding year was £784, which, added to the year's profit, makes an available sum of £14,539. Deducting the interim dividend of 3 per cent. (£7200), there is left for distribution £7339; and the Directors recommend a dividend of 3½ per cent., free of income-tax (making 6½ per cent. for the year), to pay which £1060 will have to be taken from the reserve fund. Under a ten years' contract with the Municipality of Bombay, all the public lamps are now lighted on the incandescent system, which has greatly improved the lighting of the city. At the end of December, 3805 lamps were in use—an increase of 68 for the year. There is, however, a decrease in the rental from this source, as the new burners consume less gas.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 983).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	9 Apl.	10½	Alliance & Dublin 10 p. c.	23—25	..	4 4 0
100,000	10	,,	7½	Do. 7 p. c.	17½—18½	..	4 1 1
300,000	100	2 Jan.	5	Australian (Sydney) 5% Deb.	108—111	..	4 10 11
200,000	10	29 Oct.	5	Belgrano (B. Ayres), Limited	9½—10	..	5 0 0
100,000	Stck.	30 Dec.	5	Do. 5 p. c. Deb. Stk	102—105	..	4 15 3
200,000	5	12 Nov.	6½	Bombay, Limited	6½—7½	..	4 6 8
40,000	5	,,	6½	Do. New, £4 paid	5—6	..	4 6 8
380,000	Stck.	26 Feb.	12	Brentford Consolidated	287—292	..	4 2 2
240,000	,,	,,	9	Do. New	223—228	..	3 18 7
50,000	,,	,,	5	Do. 5 p. c. Pref.	143—148	..	3 7 7
159,375	,,	11 Dec.	4	Do. 4 p. c. Deb. Stock.	130—134	..	2 19 9
220,000	Stck.	26 Mar.	11½	Brighton & Hove Original	273—278	..	4 2 8
208,820	,,	,,	8½	Do. A Ord. Stk.	197—202	..	4 4 2
933,500	Stck.	26 Feb.	5	Bristol, 5 p.c. max.	130—135	..	3 14 1
420,000	20	26 Mar.	11½	British	56½—57½	..	3 18 3
50,000	10	26 Feb.	11½	Bromley, Ordinary 10 p. c.	23—25	..	4 12 0
71,000	10	,,	8½	Do. 7 p. c.	18—20	..	4 5 0
500,000	10	28 Apl.	6	Buenos Ayres (New) Limited	9½—10*	..	6 0 0
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	101—103	..	5 16 6
150,000	20	26 Feb.	8½	Cagliari, Limited	29—31	..	5 6 5
100,000	10	30 Sept.	6	Cape Town & District, Ltd.	16—17	..	3 10 7
50,000	50	3 Nov.	6	Do. 6 p. c. 1st Mort.	57—59	..	5 1 8
550,000	Stck.	9 Apl.	13½	Commercial Old Stock	345—350	+5	3 17 2
165,000	,,	,,	10½	Do. New do.	255—260	+3	4 0 9
165,000	,,	11 Dec.	4½	Do. 4½ p. c. Deb. do.	150—155	..	2 18 0
800,000	Stck.	30 Dec.	13	Continental Union, Limited.	255—260	..	5 0 0
200,000	,,	,,	10	Do. 7 p. c. Pref.	215—220	..	4 10 11
51,600	Stck.	26 Feb.	14	Croydon Com'cial A 10 p. c.	317—322	..	4 6 11
163,400	,,	,,	11	Do. B 7 p. c.	255—260	..	4 4 7
535,000	Stck.	26 Feb.	5¼	Crystal Palace Ord. 5 p. c. Stk	139—142	..	3 13 11
60,000	,,	,,	5	Do. 5 p. c. Pref.	140—143	..	3 9 11
486,090	10	29 Jan.	11	European, Limited	24½—25½	..	4 6 3
354,060	10	,,	11	Do. £7 10s. paid	17½—18½	..	4 9 3
5,836,590	Stck.	12 Feb.	12¾	Gaslight & Coke, A, Ordinary	307—312	+6	4 1 9
100,000	,,	,,	4	Do. B, 4 p. c. max.	110—114	..	3 10 2
665,000	,,	,,	10	Do. C, D, & E, 10 p. c. Pf.	308—313	..	3 3 10
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	145—150	..	3 6 8
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	210—215	..	3 9 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	207—212	..	3 6 0
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	307—312	..	3 4 1
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	182—187	..	3 4 2
1,061,150	,,	11 Dec.	4	Do. 4 p. c. Deb. Stk.	137—142	..	2 16 4
294,850	,,	,,	4½	Do. 4½ p. c. do.	150—155	..	2 18 1
908,000	,,	,,	6	Do. 6 p. c. do.	207—212	..	2 16 7
70,000	10	29 Oct.	6	Hongkong & China, Limited	12½—13½	+½	4 8 11

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
3,800,000	Stck.	12 Nov.	10†	Imperial Continental	217—222	+7	4 10 1
376,400	100	1 Feb.	4	Do. 4 p. c. Debs. Red.	103—103	..	3 17 8
473,600	Stck.	12 Feb.	3½	Do. 3½ p. c. Deb. Stk ,,	104—107	..	3 5 5
75,000	5	11 Dec.	6	Malta & Mediterranean, Ltd.	5⅞—6¼	..	4 16 2
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	111—113	..	4 8 6
250,000	100	,,	4½	Do. 4½ p. c. Debs.	107—109	..	4 2 7
541,920	20	12 Nov.	5	Monte Video, Limited	15—16	..	6 5 0
150,000	5	26 Nov.	8	Oriental, Limited	8½—9	..	4 8 11
135,000	5	,,	8	Do. New, £4 10s. paid	7½—8	..	4 10 0
15,000	5	,,	8	Do. do. 1879, £1 paid	1½—2	..	4 0 0
60,000	5	26 Mar.	7	Ottoman, Limited	5—5½	..	6 7 3
420,000	100	3 May	6	People's Gas } 1st Mtg. Bds.	101—106*	..	5 13 1
500,000	100	1 Dec.	6	of Chicago } 2nd Do.	104—109	..	5 10 1
250,000	10	30 Sept.	10	San Paulo, Limited	13¾—14¼	..	6 18 0
5,475,000	Stck.	26 Feb.	5¼	South Metrop., 4 p.c. Ord.	141—144	..	3 12 11
1,116,667	,,	—	3	Do. 3 p.c. Deb. Stk.	104—106	..	2 16 7
60,000	Stck.	12 Mar.	11½	Tottenham & Edmonton, A	275—285	..	4 0 10
60,300	,,	,,	8½	Do. B	190—200	..	4 5 0
182,380	10	30 Dec.	10	Tuscan, Limited	14—15	..	6 13 4
149,900	10	2 Jan.	5	Do. 5 p. c. Debs. Red.	101—103	..	4 17 1
				WATER COMPANIES.			
746,159	Stck.	30 Dec.	10½	Chelsea, Ordinary	328—333	..	3 3 0
150,000	,,	,,	5	Do. 5 p. c. Pref.	175—180	..	2 15 6
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	158—162	..	2 15 6
175,785	,,	26 Mar.	4½	Do. 4½ p. c. Deb. Stock	160—165	..	2 14 6
1,720,560	Stck.	9 Apl.	7	East London, Ordinary	218—223	−2	3 2 9
654,740	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	164—169	..	2 13 4
393,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	106—108	..	2 15
700,000	50	11 Dec.	7½	Grand Junction, 10 p.c. max.	112—117	..	3 4 1
295,000	Stck.	26 Mar.	4	Do. 4 p. c. Deb. Stk.	148—153	..	2 12 4
708,000	Stck.	12 Feb.	12	Kent	340—345	..	3 9 7
160,000	,,	,,	7	Do. New, 7 p. c. max.	212—217	..	3 4 6
1,043,800	100	30 Dec.	9¾†	Lambeth, 10 p. c. max.	272—277	+2	3 10 5
406,200	100	,,	7½	Do. 7½ p. c. max.	220—225	..	3 6 8
350,000	Stck.	26 Mar.	4	Do. 4 p. c. Deb. Stk.	147—150	..	2 13 4
500,000	100	12 Feb.	13	New River, New Shares	420—425	..	3 1 1
1,000,000	Stck.	29 Jan.	4	Do. 4 p. c. Deb. Stk.	152—155	..	2 11 7
902,300	Stck.	30 Dec.	6	S'thwk & V'xhall, Ordinary	155—160	..	3 15 0
126,500	100	,,	6	Do. Do. 7½ p. c. Max.	150—155	..	3 17 5
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	175—180	..	2 15 7
1,019,585	,,	9 Apl.	4	Do. 4 p. c. A Deb. Stk.	145—148	..	2 14 2
1,155,066	Stck.	11 Dec.	10	West Middlesex	310—315	..	3 3 6
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	163—168	..	2 13 7

† Next Dividend will be at this rate.

*Ex div.

Wigan Corporation Gas Finances.—The Borough Treasurer of Wigan on Thursday informed the Gas and Electric Lighting Committee that on the net profit on the gas undertaking for the year ending March 31 last was £9696, which, together with the sum of £1036 brought forward from the previous year, leaves a balance of £10,732 in hand. It was decided to transfer £10,700 to the credit of the general district fund.

Singapore Gas Company, Limited.—The report of the Directors of this Company on the working of 1896 states that the expenditure has been unusually heavy, in consequence of the cost attending the change of management, and of repairs and renewals of plant. The rate of exchange still continues very unfavourable, and causes the Directors much anxiety. The Manager (Mr. Albert Ford) reports that the works are in good condition. The balance for appropriation amounts to £1439. Out of this sum, the Directors recommend the declaration of a dividend of 1½ per cent. for the year, free of income-tax, carrying forward a balance of £475. A new contract with the Municipality for public lighting came into force on Jan. 1 last.

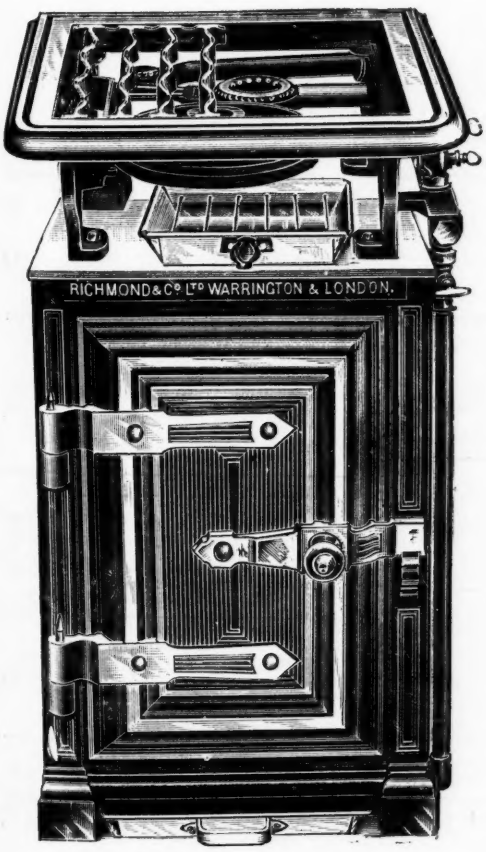
The Danger of Iron Sheeting Round Gas-Engines.—At Liverpool last Wednesday, the City Coroner (Mr. T. E. Sampson) held an inquiry touching the death of William H. Guy, a labourer in the employ of the Liverpool Warehouse and General Storage Company, Limited. On the previous Monday the deceased was working at the Company's warehouses, and was helping to start an "Otto" gas-engine. It was necessary to set the fly-wheel in motion after lighting the gas; and deceased was pulling it round, when he slipped and fell between the wheel and the engine-bed. The gas was at once shut off. A doctor quickly arrived; and he pronounced life to be extinct—the neck of the unfortunate man having been broken. Round the iron bed upon which the engine rested was a piece of iron sheeting in accordance with the requirements of the salvage and insurance authorities; and it was stated that this was somewhat slippery, as it was impossible to keep it clear of grease. Deceased never started the engine before. A verdict of "Accidental death" was returned.

Penny-in-the-Slot Machines and Copper Coinage.—In the course of his Budget statement on Thursday, the Chancellor of the Exchequer, when alluding to the operations of the Mint Authorities during the past financial year, said that more than three times as many copper coins were struck last year as in the preceding twelve months—a considerable proportion of the additional pennies coined being no doubt required for prepayment gas-meters. He said that as much as six millions sterling in value of different coins was struck at the Mint in the year just closed, as against five millions in the year preceding; and the great increase had been in silver and copper—especially in copper. No less than 25 million pieces of silver coin and 32 million pieces of copper coin were struck; 245 tons of copper being used in that coinage. He had inquired the reason. Of course, it was partly due to the increased prosperity in trade generally among the working classes. But it was, he remarked, curious to learn that, in the view of the Mint authorities, not a little of the additional demand for copper was due to the increased number of articles—whether useful or otherwise the House might decide—which could be obtained by the simple process of putting a penny in the slot.

The Finances of the Rochdale Corporation Water Department.—At a recent meeting of the Water Committee of the Rochdale Corporation, it was reported that the deficiency in their accounts for the past year amounted to £3862, against £5855 reported twelve months ago—a net reduction of £1993; and the amount now required from the rates is less by that sum than the total asked for twelve months ago. This decrease is accounted for by two items—a decrease of £1057 in expenditure, and an increase of £936 in income. Last year the expenditure amounted to £36,985; and this year it is £35,928. The increased income is made up chiefly of £531 more in the amount received as water-rental, and £311 additional for water supplied by meter.

Driffield Gas-Works Purchase and the Rates.—Last Tuesday week the Clerk laid an estimate before the Driffield District Council of the sum required for the next half year; the total amount being, less sales, £1773, of which about £800 will be required as the half-yearly payment of principal and interest on the amount to be borrowed for the purchase of the gas-works. A rate of 2s. 2d. in the pound would meet expenses. The approval of the estimate having been moved, Mr. C. Smith objected, on the ground that ratepayers who did not consume gas should not be obliged to pay for it. Mr. Shepherdson thought the town as a whole ought to meet the demand, as futurity would profit by it. Mr. White considered that, as the ratepayers would have the property in their hands in 20 years, they ought to contribute towards the repayment of the loan. The estimate was approved.

Westbury Water-Works and the Local Government Board.—The Westbury Rural District Council have received a letter from the Local Government Board in respect of an application for sanction to their borrowing the sum of £8000 for purposes of water supply for the parishes of Westbury and Dilton Marsh. The Board observe that the supply is proposed to be taken from a well in the greensand; and in the first instance, therefore, they request that a trial boring may be sunk on the site of the well, and the yield of water ascertained by continuous pumping—day and night without cessation—for a period of at least two weeks. In connection with the pumping the following observations are to be made and the results recorded: (1) The quantity of water pumped each day; (2) the level of the water when the pumping begins and when it ceases; (3) the time taken for the water to return to its original level after the pumping ceases. A report is also to be made by a competent chemist on an analysis of a sample of the water obtained from the boring. The cost of these experimental works will not however be regarded as a proper object for a loan extending over the usual term unless in the result the success of the experiment should justify the incorporation of the works in the permanent scheme. The land the District Council have acquired for the purpose of the water boring has been sold by Sir Henry Lopes for £500, with a stipulation that he shall be supplied with 5000 gallons of water per day to two troughs on the hills, for watering his cattle, and that the fishing pond in front of his house shall be kept up to a certain level; also that the Board shall not excavate beyond the two acres already arranged to be sold without new terms being agreed upon beforehand.



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Last Tuesday, an exhibition of the gas appliances manufactured by Messrs. Fletcher, Russell, and Co., Limited (with demonstrations in advanced and elementary cookery by Miss Golding), was opened at Heckmondwike, by Mr. Joseph Stead, the Chairman of the Gas Company

Messrs. Gwynne and Co., of Brooke Street Works, Holborn, have been entrusted with an important order for machinery for the Newcastle-upon-Tyne and Gateshead Gas Company. The principal portion of the contract is two exhausters, each of which is to be capable of passing 300,000 cubic feet of gas per hour. These exhausters, we believe, are as large as, or larger than, any exhausters yet made; and they are to be driven by gas-engines.

Messrs. W. Parkinson and Co. held a very successful exhibition of gas appliances in the Grammar School, Market Drayton, from Monday to Wednesday last week, under the direction of Mr. S. J. Perrett, the Manager of the gas-works. Illustrated cookery lectures were given twice daily by Mrs. Mary Kate Mills. The same firm were also exhibiting at Sevenoaks (in conjunction with the Gas Company) from Monday to Friday, with Miss Edith Sanderson as cookery demonstrator.

As from Monday of last week (till next Friday), an exhibition of gas and cookery appliances has been open in the Church Institute, Bradford—Messrs. Richmond and Co., Limited, showing their goods in conjunction with the Corporation Gas Department. During the latter days of the past month, exhibitions by Messrs. Richmond have also been held at New Mills (Derbyshire) and at Caterham Valley—under the auspices of the New Mills Urban District Council and the Caterham and District Gas Company respectively. Mrs. Middleton lectured to appreciative audiences at the two first-named places, and Miss L. Richmond at Caterham.

The Stroud (Glos.) Gaslight and Coke Company having last year extended their works by fitting up one section of their new retort-house with four through arches of regenerator settings, containing 64 retorts, with stoking machinery on West's system, obtained such good results from the new plant, and the work having been carried out in a satisfactory manner by West's Gas Improvement Company, Limited, of Manchester, Mr. George Cutler, the Engineer to the Gas Company, has recommended the Directors to complete the new retort-house by a further extension of the plant, and the tender of the West Company has been accepted for the supply and erection of four more through arches and settings, with the whole of the ironwork and stage flooring, engine, and coal-breaker with elevator to work in conjunction with the West manual charging and drawing machines which were supplied last year. The retort-house, when completed, will be capable of producing more than 1 million cubic feet of gas per day.

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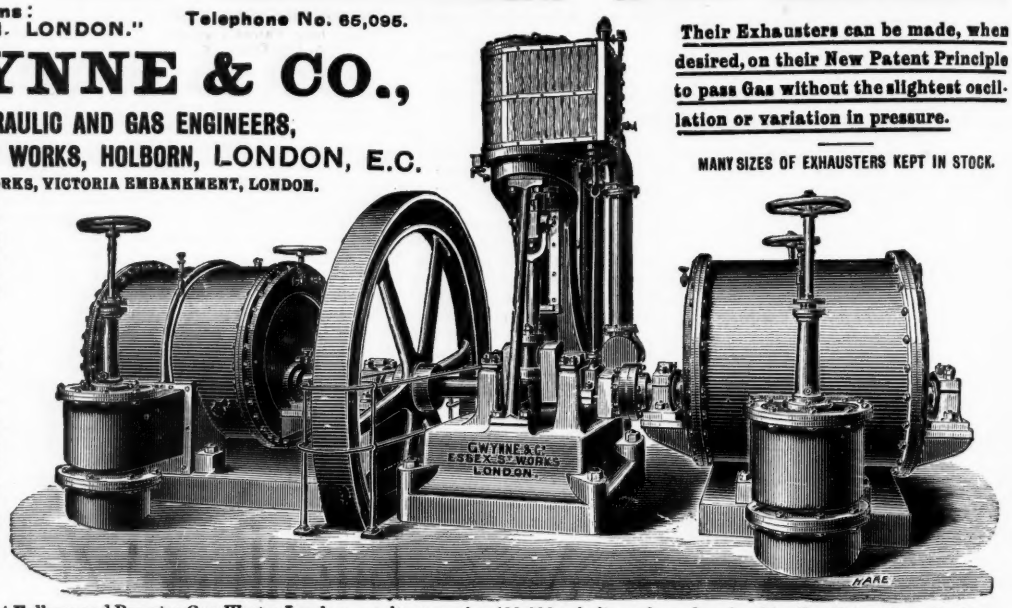

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[For Illustrated Advertisement, see p. 1020.]

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The person appointed will be required to enter upon the duties at once, reside upon the Works, and devote the whole of his time to the service of the Corporation.
Applications, stating Age and Experience, accompanied with *copies* of Testimonials, and endorsed "Assistant Engineer," to be sent to me not later than Thursday, the 13th of May.
Canvassing will disqualify.
HERBERT BRAMLEY,
Town Clerk.
Town Hall, Sheffield,
April 26, 1897.

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

ALEX. P. KER, C.E., Consulting Gas Engineer, Hunton Road, Gravelly Hill, Birmingham, 25 Years Assistant Engineer and Manager of Works to the Corporation of Birmingham and their predecessors, MAY BE CONSULTED on all matters connected with GAS ENGINEERING, including Valuations, Alterations, Additions and Extensions, &c. REPORTS upon EXISTING WORKS and IN PROGRESS. EXAMINATIONS OF GAS for ILLUMINATING POWER and IMPURITIES conducted. Plans, Specifications, and Estimates prepared.

SECRETARY AND ASSISTANT MANAGER

WANTED, for a small Syndicate en- gaged in developing a Gas-Enriching Patent. Must understand Book-keeping, as well as Gas Engineering.
Apply, by letter, to No. 2844, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

COLLIERIES, ENGINEERS, AND GAS-WORKS.

A FIRM of Leeds Engineers, of long standing, with Central Offices, are open to act as SOLE AGENTS in Yorkshire and Lancashire, for the Sale of Goods to the above. Would undertake to open and manage Branch Warehouse if required.
Address No. 2837, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, at once, a Manager for Chemical Works (responsible for manufacture only). Must have good knowledge of Chemical operations generally, more particularly in Tar and Sulphate of Ammonia manufacture, accustomed to erection and repair of Plant, and able to keep Works' Books. Workmen's Hours.
Write, giving Age, Experience, Salary, and References, to No. 2843, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

COUNTY BOROUGH OF WIGAN.
(GAS DEPARTMENT.)

WANTED, a good Carbonizing Fore- MAN. Wages two guineas per week. Applicant to state Age and Experience, and whether Married or not.
Applications, in writing, to be sent, with References only, to
JOS. TIMMINS.
Borough Gas-Works, Wigan,
April 30, 1897.

WANTED, at a Gas-Works in a Sea- side Town in the Eastern Counties, where the make is from 50 million to 60 million cubic feet per annum, a FOREMAN, capable of taking entire charge of the works and the making of all the usual Gas Tests.
Any person thoroughly capable of holding, and desirous of having, such an appointment, may forward to the undersigned a statement of his Experience, Salary expected, and a few Testimonials from persons under whom he has worked, the envelope to be marked "Gas Appointment."
Applicants should also state Age, and if Married, and if at present in or out of employment.
JOHN AYRIS.
8, Brandon Terrace, Great Yarmouth,
April 22, 1897.

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

GAS TAR and Ammoniacal Liquor Wanted.
Apply to JOSIAH HARDMAN, Milton, STAFFS.

WANTED, a 20,000 to 30,000 per hour second-hand STATION METER, in good working condition.
Price and full Particulars to be sent to R. SANDELL, 3, Jeffreys Square, St. Mary Axe, LONDON, E.C.

WANTED, to purchase Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.
Address, stating Price per ton and quantity, No. 2772, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE, in good condition—A TRAVELLING HOIST. Suitable for Purifiers up to 24 feet square.
Can be seen on application at the GAS-WORKS, Windsor Street, BIRMINGHAM.

BLUE PRINTS of all kinds in any weather. Drawings and Tracings promptly executed.
J. L. FEATHERSTONE, 21, Old Queen Street, WESTMINSTER, S.W.

ECONOMY IN PURIFICATION.

INCREASE the Efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
References and Particulars can be obtained from the Makers—
C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP.
And J. EVERY & SON, Phœnix Iron-Works, LEWES.

FOR SALE—A Station Meter complete, in thorough working order. Recently overhauled and certified correct by Messrs. Braddock. Capacity, 50,000 feet per hour.
Apply to JOHN H. DARBY, Brymbo, near WREXHAM.

FOR SALE—A Round Station Meter, and 6-inch Connections. Capable of passing 6000 cubic feet of Gas per hour. A Bargain.
Address No. 2842, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE, a Bargain—Sixty 15-inch Round TANGYE MOUTHPIECES, 120 15-inch by 14-inch ⏢ TANGYE'S MOUTHPIECES, with Ascension and Dip Pipes, and Cast-Iron Hydraulic Mains, complete. Will sell the whole or any portion. All the above is in excellent condition, and must be cleared.
Apply to W. T. JINKIN, Contractor, Endsleigh Building Yard, PLYMOUTH.

URBAN DISTRICT COUNCIL OF STOURBRIDGE.
(GAS DEPARTMENT.)

THE Gas Committee have for Sale a good SINGLE-LIFT GASHOLDER, 61 ft. by 22 ft., with Columns and Girders complete. May be seen at Work at the Stourbridge Gas-Works.
WM. NORTH,
Engineer and Manager.
April 21, 1897.

WARRINGTON CORPORATION.
(GAS DEPARTMENT.)

REMOVAL OF WORKS.

FOR SALE—18-in. by 14-in. ⏢, and 15- inch and 18-inch Round, MOUTHPIECES, HYDRAULIC MAINS, ASCENSION-PIPES, FURNACE FITTINGS, EXHAUSTERS, TAR-WASHER-18-inch CENTRE and FOUR-WAY PURIFIER VALVES, 12-inch HYDRAULIC CENTRE-VALVE, METER (12-inch Connections), ENGINES, PUMPS, &c.
Apply for Particulars to Mr. W. B. Haddock, Engineer.
FREDK. TAYLOR, Secretary.
Gas-Works, Warrington.

CORPORATION OF MANCHESTER.

TENDERS FOR COAL AND CANNEL.

THE Gas Committee are prepared to receive, on or before Thursday, the 3rd of June next, OFFERS of high-class CANNELS and COALS, suitable for Gas making, for delivery at their Gaythorn, Rochdale Road, and Bradford Road Works, during a period of One, Two, or Three years, commencing the 1st of July, 1897 for CANNEL, and the 1st of October, 1897, for COAL.
Particulars and printed Forms of Tender may be obtained on application (in writing only) to Mr. Charles Nickson, Superintendent, Gas Department, Town Hall, Manchester.
By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.
Town Hall, Manchester,
May 1, 1897.

MANCHESTER CORPORATION GAS-WORKS.

AMMONIACAL LIQUOR.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the purchase and removal of the AMMONIACAL LIQUOR to be produced at the Gaythorn, Rochdale Road, and Bradford Road Gas-Works during a period of one or more years, commencing at noon on the 20th day of June, 1897.
The Committee do not bind themselves to accept the highest or any tender.
Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Ammoniacal Liquor," must be delivered at the Offices of the Gas Department, Town Hall, on or before Wednesday, the 26th of May, 1897.
Forms of Tender and further Particulars may be obtained on application, in writing only, to Mr. Charles Nickson, Superintendent of the Department.
A deposit of one guinea (which will be returned on receipt of the tender) must accompany each application for a tender form.
By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.
Town Hall, Manchester,
May 1, 1897.

DENTON URBAN DISTRICT COUNCIL.
(Gas Department.)

COAL.

THE Gas Committee invite Tenders for the supply of COAL, the same to be sent in on or before the 13th of May next.

Specification and Form of Tender may be obtained from the Manager, Mr. J. Chadwick Smith, Gas-Works, Denton, near Manchester.

The Committee do not bind themselves to accept the owest or any tender.

By order,
John Richards,
Clerk to the Council.

April 30, 1897.

DENTON URBAN DISTRICT COUNCIL.
(Gas Department.)

TAR.

THE Gas Committee invite Tenders for the purchase of the surplus TAR, the same to be sent in on or before the 13th of May next.

Particulars may be obtained from the Manager, Mr. J. Chadwick Smith, Gas-Works, Denton, near Manchester.

The Committee do not bind themselves to accept the highest or any tender.

By order,
John Richards,
Clerk to the Council.

April 30, 1897.

THE URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to receive TENDERS for the supply of GAS COAL, to be delivered at their Gas-Works in Lymm, for a term of One Year from the 1st day of July, 1897.

The probable quantity required will be about 1400 tons, which must be freshly wrought, and well screened, and free from Sulphurous Pyrites or other objectionable matter; but the Council reserve the right of increasing or decreasing the quantity named.

The person whose tender is accepted will be required to enter into an Agreement with the Council for the due performance of his Contract.

Sealed tenders, stating price per ton delivered alongside the Works, to be sent to Wm. Mullard, Esq., Clerk to the Council, on or before the 25th day of May, 1897, endorsed "Coal Tender."

The Council have no special Form of Tender, and do not bind themselves to accept the lowest or any tender.

Further Particulars may be had on application to
Robert Surtees,
Gas Manager.

Lymm, Cheshire,
May 1, 1897.

THE URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Gas-Works, for a term of One Year from the 1st day of July, 1897.

The Tar and Liquor will be delivered free into Contractor's Boat on the Bridgewater Canal.

The Purchaser will have to enter into an Agreement with the Council for the due performance of his Contract.

Sealed tenders, stating price per ton for Tar and price per ton for Liquor (5° Twaddel), to be sent to Wm. Mullard, Esq., Clerk to the Council, on or before the 25th day of May, 1897, endorsed "Tar Tender."

The Council do not bind themselves to accept the highest or any tender.

Further Particulars may be had on application to
Robert Surtees,
Gas Manager.

Lymm, Cheshire,
May 1, 1897.

CORPORATION OF NOTTINGHAM.
(Gas Department.)

TENDERS FOR COAL.

THE Gas Committee are desirous to receive OFFERS for supplies of COALS, COBBLES, or NUTS, for the period terminating the 30th of June, 1898.

The Large Coals and the Cobbles or Nuts are to be separately delivered, where and as from time to time directed, by and at the expense of the Contractors, upon the Gas-Works Siding, Great Northern Railway, in the East Croft at Nottingham, and also on the Gas-Works Sidings, Midland Railway, at Radford and Basford respectively; and at and after the rate of one-eighth part of such total quantity in each calendar month, commencing with the month of July next, till the Corporation shall be satisfied with the amount of accumulated Stock, and afterwards at such rate as shall be from time to time directed, till the agreed quantity shall have been delivered.

The Coals, Cobbles, or Nuts are to be the best of their respective kinds, freshly wrought and WELL-SCREENED (Description, Sizes, and Inclination of Screen to be specified), to be as free as possible from Sulphur, Bats, Bind, Refuse, and Dirt, and shall be weighed (20 cwt. to the Ton) upon the Corporation Machines, or upon such other Machines as may be mutually agreed upon.

Payments will be made monthly, if and so long as the contract shall be duly fulfilled.

The Corporation do not bind themselves to accept the lowest or any tender.

Further Information and Forms on which the tenders must be made, may be obtained on application to me, at the General Manager's Office; and the tenders (sealed), specifying the description of Coals, the Seam, and the Pits at which they are to be raised, and stating the prices for deliveries at the several places and in manner and subject to the conditions aforesaid, must be delivered to SIR SAMUEL GEORGE JOHNSON, Kt., Town Clerk, on or before Saturday, the 8th day of May, 1897.

By order,
William Reginald Chester,
Engineer and General Manager.

Corporation Gas Offices, George Street,
Nottingham, April 29, 1897.

BOROUGH OF CLITHEROE.

THE Gas Committee invite Tenders for the supply and erection of two PURIFIERS, with Covers, Wood Grids, Girders, and Lifting Apparatus, and two Four-Way Valves.

Specification may be seen, and all necessary Information obtained, at the Office of the undersigned.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Purifiers," to be addressed here not later than Saturday, the 15th of May next.

The Committee do not bind themselves to accept the lowest or any tender.

Robt. Barrett,
Manager.

Gas-Works, Clitheroe,
April 21, 1897.

URBAN DISTRICT COUNCIL OF DUKINFIELD.

TENDERS FOR GAS COAL.

THE Gas Committee require Tenders for 7000 Tons of GAS COAL, to be delivered by Road, Rail, or Canal, commencing on the 1st of May next, and concluding the 30th of June, 1898. None but fresh-got screened best quality GAS COAL, free from faults, need be offered; and no Testimonials or Analyses are required.

No tender will be considered which may be received after Twelve noon on Monday, the 31st of May.

Sealed envelopes, endorsed "Coal," to be directed to the Chairman of the Committee, Mr. Councillor Stafford, Gas Offices, Charles Street, Dukinfield.

Tender Forms and further Particulars on application to
Harrison Veevers, C.E.,
Engineer and Secretary.

Dukinfield, April 27, 1897.

DEVONPORT GAS AND COKE COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Devonport Gas and Coke Company invite TENDERS for the supply of 16,000 Tons or 8000 Tons (at their option) of unscreened (through and through) NEWCASTLE or DURHAM GAS COAL, to be shipped in such quantities and at such times as may be required, between the 1st of August, 1897, and the 31st of July, 1898. The Cargoes are to be discharged at the Tamar Wharf, Devonport.

Tenders may be quoted either c. i. f. or f. o. b.—but c. i. f. preferred—endorsed "Tender for Coal," addressed to the Chairman, Devonport Gas and Coke Company, Devonport.

Tenders to be sent in on or before Monday, the 17th of May next.

Devonport, May 1, 1897.

TO MANUFACTURING CHEMISTS.

TAR AND AMMONIA WATER.

THE Directors of the Loughborough Gas Company are prepared to receive TENDERS for the surplus TAR and AMMONIA WATER, to be produced at their Works for One Year, from the 30th day of June.

The estimated quantities will be about 350 Tons of Tar, and 900 Tons of Ammonia Water. The Tar and Liquor to be delivered into the Contractor's Boats at the Wharf, on the Derby Road, Loughborough.

The Strength of the Liquor to be tested by Twaddel's Hydrometer (temperature 60°); and the tender to state the price per ton of 4°, rising ½° up to 8°.

The Boats for the removal of the Tar and Liquor to be sent at such times as may be required. Payments the 10th of following month.

Further Information may be obtained on application to the undersigned, to whom tenders, in accordance with this Advertisement, must be sent not later than the 10th day of May, 1897.

The Directors do not bind themselves to accept the highest or any tender.

J. B. Ball, C.E.,
Manager.

Loughborough, April 29, 1897.

HINCKLEY URBAN DISTRICT COUNCIL.
(Gas Department.)

EXTENSIONS.

TENDERS are invited for the following APPARATUS to be delivered, erected, and put to work at the Gas-Works, Hinckley:—

1. ENGINES and EXHAUSTERS—Two Complete Sets of Engines and Exhausters combined, each for 20,000 cubic feet per hour.
2. BOILERS—Two Cornish Steam-Boilers of 12-horse power, complete, with Donkey Feed-Pump Injectors, and all necessary Fittings.
3. SCRUBBERS and LIVESEY WASHER—Two Tower Scrubbers, 55 feet high, 8 feet diameter, Spiral Staircase, &c., and a Livesey Patent Washer for 500,000 cubic feet per day.
4. PURIFIERS—Four Purifiers 20 feet square, 14-inch Connections, and Six Four-way Valves, Lifting Apparatus, &c.
5. PUMPS—Three Fly-wheel Steam-Pumps, Evans's make, for Tar, Liquor, and Fresh Water.
6. METER—One Station Meter for 20,000 cubic feet per hour, with 14-inch Valves and Connections.
7. GOVERNORS—One 15-inch Station Governor.
8. LABORATORY FITTINGS, &c. — Standard Photometer (Letheby-Bunsen System), with complete Set of Instruments and Fittings; Sulphate and Ammonia Testing Apparatus, &c.

Specifications and any further Information may be obtained on application to the undersigned.

No tender will be considered unless strictly conforming to the specifications.

The Contractor or Contractors will be required to enter into a contract and bond as security for the due performance of his or their contracts.

Sealed tenders, suitably endorsed, and addressed to the Chairman of the Gas Committee, Gas-Works, Hinckley, to be delivered at or before midday Monday, the 17th of May, 1897.

Geo. Helps,
Engineer and Manager.

Gas-Works, Hinckley.

THE Gas Committee of the Heywood Corporation invite TENDERS for the supply of 600 yards of 3-inch CAST-IRON PIPES and SPECIALS.

Specification and Form of Tender may be obtained on application to Mr. W. Whatmough, Gas Manager.

Sealed tenders, endorsed "Iron Pipes," to be sent to me not later than Tuesday, May 18, 1897.

By order,
J. H. Baldwick,
Town Clerk.

Municipal Buildings, Heywood,
April 30, 1897.

THE Corporation of Middleton are pre- pared to receive TENDERS for RAISING the ROOF of the RETORT-HOUSE at their Gas-Works.

Plans, &c., may be seen, and Specifications obtained, on application to Mr. T. Duxbury, Gas Manager, after Wednesday, the 5th of May, between the hours of 9.30 and 11.30 a.m.

Tenders, endorsed "Tender for Raising Roof," and addressed to the Chairman of the Gas Committee, to be delivered at my Office not later than Wednesday, the 19th of May, 1897.

The Corporation do not bind themselves to accept the lowest or any tender.

Frederick Entwistle,
Town Clerk.

Town Clerk's Office, Middleton,
April 29, 1897.

TENDERS FOR GAS COAL.

THE Corporation of Droitwich invite TENDERS for the supply of from 1100 to 1300 Tons of best screened GAS COAL, to be delivered free at Droitwich (G.W.) Railway Station, at such times and in such quantities as may be required, prior to the 31st of May, 1898.

Particulars and Form of Tender may be obtained on application to the Manager of the Gas-Works.

Sealed tenders, on the form provided for the purpose (with the Analysis of the Coal to be supplied), endorsed "Tender for Gas Coal," to be sent to the undersigned on or before the 8th of May.

The Corporation do not bind themselves to accept the lowest or any tender.

S. John Tombs,
Town Clerk.

Droitwich, April 23, 1897.

CORPORATION OF LEICESTER.

GAS COAL.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply of COAL, COBBLES, or NUTS (about 140,000 Tons per annum) for One or Two Years ending May 31.

Particulars and Form of Tender can be obtained on application to the Engineer.

Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Gas Coal," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, May 8 next.

The Committee do not bind themselves to accept the lowest or any tender.

Alfred Colson, M.Inst.C.E.,
Engineer and Manager.

Offices: Millstone Lane,
Leicester, April 21, 1897.

CARDIFF GASLIGHT AND COKE COMPANY.

TENDERS FOR COAL.

THE Directors of the above Company are prepared to receive TENDERS for a supply of 45,000 Tons of best well-screened large GAS COAL, to be delivered between July, 1897, and the 30th of June, 1898, in monthly quantities, in accordance with the Specification.

Parties tendering may do so for the whole quantity, or for quantities from 5000 Tons upwards.

Forms of Tender and Specification of monthly deliveries may be obtained on application to the Engineer and Manager, Mr. H. Morley, M.Inst.C.E.

Sealed tenders to be sent to the undersigned not later than Ten a.m., Tuesday, the 25th day of May next, addressed to the Chairman of the Company, and endorsed "Tender for Coal."

The Directors do not bind themselves to accept the lowest or any tender, and reserve to themselves the right to apportion the whole quantity as they may think fit.

By order,
George Clarry,
Secretary.

Gas Offices, Cardiff,
April 24, 1897.

LLANDUDNO URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL.

THE Llandudno Urban District Council invite TENDERS for the supply of 5000 Tons of best screened GAS COAL, capable of producing a minimum of 10,000 Cubic Feet of 18-candle Gas per ton, to be delivered, carriage paid, between the 1st of July next and the 30th of June, 1898, at the Llandudno Station of the London and North-Western Railway, in such quantities and at such periods as may be ordered from time to time.

Forms of Tender may be obtained on application to the undersigned; and only such Tenders as are upon the prescribed form will be considered.

In every case where the Particulars asked for are not given, the tender will be thrown out, and not considered.

Tenders must be sent to the undersigned not later than the 29th inst.

The tender of any Person or Firm who personally or through an Agent canvasses any of the Officers or Members of the Council will be thrown out, and not considered.

The Council do not bind themselves to accept the lowest or any tender.

By order,
A. Conolly,
Clerk to the Council.

May 1, 1897.

CRANLEIGH GAS & COKE COMPANY, LIMITED, CRANLEIGH, SURREY.

COAL SUPPLY FOR THE YEAR JUNE 24, 1897, TO JUNE 24, 1898.

THE Directors invite Tenders for the supply of 470 to 500 Tons of HOLMSIDE COAL, to be delivered in about 50-Ton lots at Cranleigh Station (L.B. & S.C. Railway), as ordered.

Tenders, under cover, marked "Coal," to be sent to me on or before May 10, 1897.

H. J. HAYMAN,
Secretary.

CANTERBURY GAS AND WATER COMPANY.

TENDERS FOR GAS COAL.

TENDERS are invited for the supply of best NEWCASTLE GAS COAL for One, Two or Three Years, at the Purchasers' option, commencing on the 1st of June next.

Forms of Tender, containing full Particulars as to the quantities required and conditions of the Contract, may be obtained on application to the undersigned.

Sealed tenders, endorsed "Coals," to be delivered at the Company's Offices, on or before Saturday, the 22nd of May next.

JAMES BURCH,
Secretary.

39, Castle Street, Canterbury,
April 26, 1897.

SOUTH SHIELDS GAS COMPANY.

TO COALOWNERS.

THE Directors of the South Shields Gas Company invite TENDERS for the supply of 40,000 Tons of clean, unscreened GAS COAL, for delivery, into Craft, and at the Company's Depôt, South Shields, as required, over a period of Twelve Months.

The Directors reserve to themselves the right of taking the Coal in one or more lots.

The lowest or any tender not necessarily accepted.

Particulars as to Deliveries, &c., may be obtained at the Gas-Works, on application to Mr. W. J. Warner, the Engineer.

Sealed tenders to be delivered to the undersigned, not later than Friday morning, the 7th of May next, endorsed "Tender for Coal."

J. H. PENNEY,
Secretary.

Gas Offices, Chapter Row, South Shields,
April 23, 1897.

ARBROATH GAS CORPORATION.

TO GASHOLDER MAKERS.

THE Arbroath Gas Corporation invite TENDERS for the Erection of a New TWO-LIFT TELESCOPE GASHOLDER.

This Holder is to be placed in a Stone Tank, already erected, 67 feet in diameter by 18 feet deep.

Other Particulars can be had from the Manager, Mr. R. S. Carlow.

Tenders, with Specifications and Tracings, to be delivered to the undersigned, not later than Monday, the 10th day of May next.

Parties tendering will not be paid for lodging Specifications and Tracings.

The Arbroath Gas Corporation do not bind themselves to accept the lowest or any tender.

ROBERT S. CARLOW,
Engineer and Manager.

Gas-Works, Arbroath,
April 22, 1897.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Powers.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

By Order of the Directors.

500 SHARES IN THE
SOUTHEND WATER-WORKS COMPANY.

MR. ALFRED RICHARDS will Sell by AUCTION, at the Mart, E.C., on Wednesday, May 26, at Two o'clock, in lots, 500 £10 SHARES (to be issued as fully paid) in the above Undertaking, ranking for a Maximum Dividend of 7 per cent.; the last Dividend on the same class of Shares having been at the rate of 5 per cent. per annum.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of the Directors.

2000 SHARES IN THE
WEST HAM GAS COMPANY.

MR. ALFRED RICHARDS will Sell by AUCTION, at the Mart, E.C., on Monday, May 10, at Two o'clock, in lots, 2000 £10 FULLY-PAID SHARES in the above Undertaking, to be issued under the Provisions of the West Ham Gas Act, 1889; the Dividends on these Shares rising or falling according to the Price charged for Gas. The last Dividend on the Company's £10 Shares was at the rate of 6½ per cent. per annum.

Particulars of the SECRETARY of the Company, at the Offices, STRATFORD; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

E. ASQUITH & CO.,
Hydraulic Engineers,
17, Mather Street, Ancoats, Manchester,
Fit up Plants for
Pressing Anthracene, Naphthalene, &c.
Competent Men sent out to erect same. Estimates given.

BOROUGH OF BARROW-IN-FURNESS.

SUPPLY OF COAL AND CANNEL.

THE Corporation are prepared to receive TENDERS, on Forms to be obtained at the Office of the Gas-Works Manager, for the supply of screened GAS COAL and CANNEL for the Year ending the 30th of June, 1898.

Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Coal," to be delivered at the Town Clerk's Office, not later than Twelve o'clock Noon, on Wednesday, the 12th day of May, 1897.

The lowest or any tender not necessarily accepted.

By order,
C. F. PRESTON,
Town Clerk.

Town Hall, Barrow-in-Furness,
April 30, 1897.

CHERTSEY GAS COMPANY.

MESSRS. EDWIN FOX AND BOUSFIELD will include in their next Stock and Share Auction, on Wednesday, May 5, at Two o'clock, in lots, ORDINARY £5 SHARES (Dividend 11½ per cent.), and NEW £10 SHARES (Dividend 8½ per cent.), in the Chertsey Gas Consumers' Company.

Particulars of Messrs. EDWIN FOX and BOUSFIELD, 99, Gresham Street, BANK, E.C.

BY EDWIN FOX AND BOUSFIELD,
AT THE AUCTION MART,
ON WEDNESDAY, MAY 12, AT TWO, IN LOTS.
By order of the Directors.

CRAYS GAS COMPANY.

ISSUE of £10,000 THREE per CENT. DEBENTURES.

THE Company was incorporated in 1865. The Authorized Capital is £40,000, and there has been issued £40,000 (including £5161 premiums) in 1996 10 per cent. Shares of £10 each, eight 10 per cent. Shares of £5 each, and 1484 7 per cent. Shares of £10 each, fully paid. Dividends of 10 per cent. and 7 per cent. respectively have been paid since 1879. In lots to suit large and small Investors.

Particulars at Messrs. EDWIN FOX AND BOUSFIELD'S OFFICE, 99, Gresham Street, BANK, E.C.; and of the Solicitors to the Company, Messrs. MAY, SYKES, and Co., Suffolk House, LAURENCE POUNTNEY HILL, E.C.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

Lanemark Coal Co.,
LIMITED.
LANEMARK CANNEL AND GAS COALS.
Quotations and Analysis on Application to
LANEMARK COLLIERY,
NEW CUMNOCK, N.B.
Shipping Ports: All the principal Scotch Ports.

WATERBLEAN PAINT

TELEGRAMS:
"EVESON, BIRMINGHAM."

COKE-BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
New Design, with two Cutting Rollers, making less Breeze than their old pattern.
GEORGE WALLER & CO.,
165, QUEEN VICTORIA STREET, E.C.,
And at STROUD, GLOUCESTERSHIRE.

HOLMSIDE GAS COALS.
PRESENT DAILY PRODUCE OVER 4000 TONS.
LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton . .	11,205 Cubic Feet.
Illuminating Power,	16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality)	13¾ Cwt. Per Ton.
Sulphur	A little over 1 Per Cent.
Ash	Under 1 Per Cent.
Tar	163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor	103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.
PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.
RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . .	10,500 Cubic Feet.
Illuminating Power .	17 Stand. Sperm Candl.
Coke (of excellent quality) .	13½ Cwt. Per Ton.
Sulphur	1·13 Per Cent.
Ash.	1·34 Per Cent.
Tar.	180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor	94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from
MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton . .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For Prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON,
FITTER.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 34, OLD BROAD ST., E.C.

GAS ILLUMINATION JUBILEE DEVICES.

ORDER EARLY

ORDER EARLY

PRICE LISTS ON APPLICATION

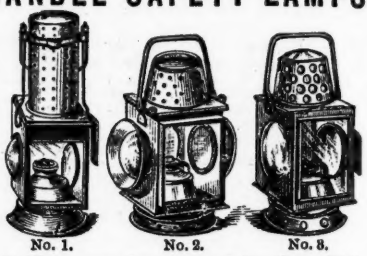
JAMES MILNE & SON

— LIMITED —

EDINBURGH, LONDON, LEEDS AND GLASGOW.

ARMSTRONG'S PATENT

CANDLE SAFETY LAMPS.



No. 1. No. 2. No. 3.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,

COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

E. FOSTER & CO.,

21, JOHN STREET, ADELPHI, LONDON, W.C.

INCANDESCENT STREET LIGHTING.

THE ONLY SUCCESSFUL ECONOMICAL AND EFFICIENT

ANTI-VIBRATION SYSTEM.

Every Gas Engineer, Gas Manager, and Lighting Authority should adopt it.

Applicable to existing Lamps.

THE LARGEST INSTALLATION OF INCANDESCENT STREET LIGHTING IN ANY BRITISH TOWN IS ON THIS SYSTEM.

SUCCESSFUL RESULTS GUARANTEED IN ALL SITUATIONS.

Full Particulars on Application to

THE ANTI-VIBRATION INCANDESCENT LIGHTING COMPANY,

Limited,

12 & 14, WESTGATE ARCADE, BRADFORD, YORKS.

WE HOLD THE ORIGINAL PATENTS.

THE

LIGHTING CORPORATION, Ld

(Late Wenham Company),

4, BLOOMSBURY STREET, W.C.,

And 61, NEW OXFORD STREET, W.C.

COMPLETE CHECK PREPAYMENT METER

ON VIEW AT THE ABOVE ADDRESS.

BEST SYSTEM OF GENERATING ACETYLENE GAS.

THE NEWEST AND MOST PERFECT BURNERS.

Members of the Institution of Gas Engineers are invited to inspect the Show-Rooms of the Lighting Corporation, Limited, on the occasion of the forthcoming Meeting in London. The IMPROVED REGENERATIVE SYSTEM can be seen by means of specially darkened galleries at any hour of the day.

The WESTMINSTER GAZETTE says:

"Light, more light!" is an old cry of many modern applications. The ordinary householder is puzzled to know why he cannot get enough light in his rooms to show off his treasures of art; and he dislikes too many burners—too much gas damages his pictures and rots his books. But all things come to those who wait; and great results have been achieved by the Lighting Corporation, of Bloomsbury Street, Oxford Street, W.C. The house occupied by the Company has an interest of its own. It was Sir James Thornhill's residence; and a beautiful old London house of the Adam time it is. By way of experiment the Corporation has lighted each room on a model principle; the system is to flood the room with a pure clear light, and at the same time to provide thorough ventilation. Hence you get your light without the discomfort of heat, and, above all, without poisoning the atmosphere of the room. In a couple of instances, the test is a severe one. The rooms are without windows, and yet the air is perfectly cool. The light is fitted in the centre of the ceiling, a Wenham lamp being used. But the Wenham of to-day is not to be looked upon as a twin brother of the old lamp. The light has been vastly improved. In the house there is a specimen billiard-room, and here the evenness of the light is apparent; and although the ceiling is low, the air is cool. A big crowd enjoyed their Havanas in all the rooms, and yet "the cloud" had as little effect on the air of the place as it would on the atmosphere if the patrons of the weed had been partaking of their puff in the public highway. Certainly it seems as if the Wenham light has a new future before it. Already it is in use in many public places, such as the Cavour and Woolpack restaurants, St. Patrick's Church, Soho Square, and we understand that a trial of the light is being made in the streets of a prominent portion of the St. George's (Hanover Square) district.

THE LIGHTING CORPORATION, LIMITED,

(late WENHAM COMPANY),

4, BLOOMSBURY STREET, W.C.; and 61, NEW OXFORD STREET, W.C.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

EXTRACTION APPARATUS

SPECIALLY DESIGNED

TO EXTRACT THE SULPHUR FROM SPENT OXIDE.

BUILT BY

WEGELIN & HÜBNER, HALLE a/S.

ENGINEERS AND IRONFOUNDERS.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

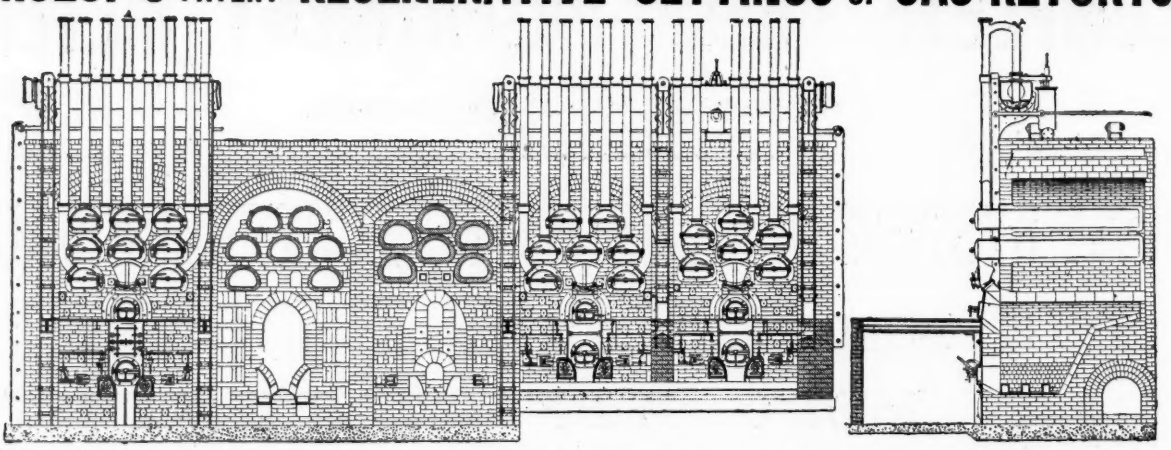
Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Full Particulars may be had on application to the Patentee's Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, 5, Stuart Street, Shawlands, Glasgow, Agent for Scotland and Ireland; and to the Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non*

TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

The Patentee's SELF-SEALING CAPS FOR THE TOP OF ASCENSION-PIPES, and his "SPECIAL" FLUE PORT BOXES, are most important additions to his Carbonizing Plant.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S Patents, all Spent Limes are effectively recovered at from one-third to one-half the cost of New Lime.
Further Information and Pamphlets from Principal Agent.

HEATHCOTE GAS COAL.

RICH IN ILLUMINATING POWER AND YIELD OF GAS.

ABOVE THE AVERAGE IN WEIGHT AND QUALITY OF COKE.

MAINTAINS A HIGH STANDARD IN RESIDUALS.

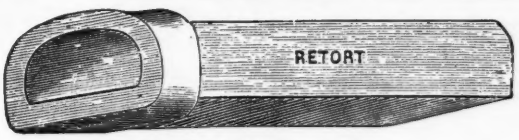
THE GRASSMOOR Co., Ld., CHESTERFIELD.

PHILADELPHIA EXHIBITION, 1876.

ALSO SILVER MEDAL, PARIS.

The Highest Award for Gas-Retorts and other Goods in Fire-Clay has been awarded to KING BROTHERS for their Goods made from their renowned Stourbridge Fire-Clay.

KING BROTHERS,



Proprietors of

STOURBRIDGE CLAYS,

Manufacturers of

Fire-Bricks, Tank Blocks, Glass-House Bricks and Pots, Gas-Retorts, Crucibles in Clay and Plumbago, Gas-Oven Bricks, Bricks for Regenerator Furnaces and Hot-Air Stoves.

STOURBRIDGE, ENGLAND.

CRUCIBLE MANUFACTORY, 46, PENN STREET, CURZON STREET, BIRMINGHAM.

N.B.—Gas, Blast-Furnace, and Glass-House Bricks and Glass-House Pots always in Stock, or made on the Shortest Notice.

G. & J. HAIGH,

Raven's Lodge Fire-Brick Works, DEWSBURY.

FIRE-BRICKS of the highest Quality, made rom Fire-Clay of a most Superior and Refractory Character, suitable for GLASS-WORKS, GAS-WORKS, and BLAST-FURNACES.

WHITE GLAZED AND SALT GLAZED BRICKS, BUFF FACING BRICKS, &c.

For Prices and Analysis, apply as above.

SUNLIGHT INCANDESCENT GAS-BURNER.

Free from all Infringements.

EXTRACTS FROM THE JUDGMENT GIVEN BY THE

Hon. Mr. JUSTICE WILLS.

"No use is made by the Defendants of any of the 'rare earths;' and their choice of substances and their method of applying the illuminants appear to me to be as wide asunder as the poles from those contemplated by Welsbach."

Welsbach Company's Counsel "both admit that they have no case unless the Welsbach skeleton, of whatever resistant earth oxides composed, is within the Welsbach Patent. It seems to me that this is just what Welsbach did not claim."

THE FOLLOWING CERTIFICATE IS GIVEN WITH EVERY MANTLE:—

"**The New Incandescent (Sunlight Patent) Gas Lighting Company, Limited,** hereby certify that the within Mantle is in every respect similar in Process of Manufacture and constituent parts or substances to the Mantle which was held by the Hon. Mr. Justice Wills **NOT to be an Infringement of the Welsbach Patent.**"

PRICE LIST AND TERMS UPON APPLICATION.

THE NEW INCANDESCENT (SUNLIGHT PATENT) GAS LIGHTING CO., LIMITED.

33 & 34, Shoe Lane, London, E.C.

THE

MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

Over 50 Maxim Patent Carburettors have now been fixed, capable of enriching

650,000,000

CUBIC FEET OF GAS PER DAY.

Among the Companies supplied are The Gaslight and Coke Company, the South Metropolitan Gas Company, Birmingham Corporation, Manchester Corporation, Rochdale Corporation, Bristol Gas Company, and many other Works, both large and small, where they have been working in some instances for the past **FOUR YEARS.**

More Gas and saleable Coke per ton of Coal Carbonized is produced; saving Capital, Labour, Fuel, Wear and Tear, &c.

The Enrichment is **INSTANTANEOUS** and **PERMANENT.**

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

SOLE AGENTS FOR REDWOOD & CLOWES' INFLAMMABLE VAPOUR & GAS DETECTORS.

Dealers in Carburine and all other Naphthas for the Enrichment of Gas.

FOR PRICES AND FULL PARTICULARS, APPLY TO

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

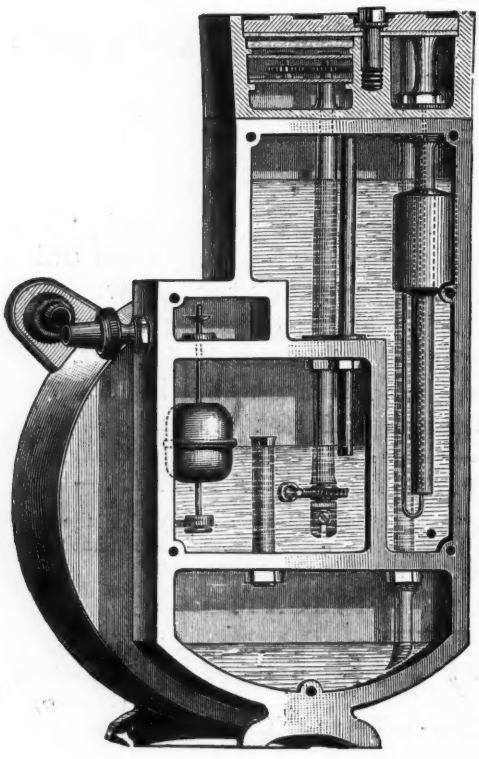
18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

ALDER AND MACKAY,

MANUFACTURERS OF

IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.



Sole Makers of Green's Patent Underground Wet Gas-Meters for Street Lighting, &c., and Ogden's Patent Spindle Tube for Wet Gas-Meters.

GREEN'S PATENT
UNDERGROUND METER

Has been designed to obviate that which has hitherto prevented the general adoption of underground Meters—namely, their serious cost No box is required; and the saving thus effected as compared with ordinary underground Meters, where either a box or meter-pillar is necessary, is fully one-half. The price of one for three lights is 28s.; and the other sizes are correspondingly cheap. When fixed, the only part of the Meter exposed to view measures 6½ inches by 3½ inches. By the Indicator with which the Meter is fitted, the Inspector can at once discern whether water is required; but as the Meter is of the compensating description, water will probably need only be supplied ONCE A YEAR. It is advisable to fill the Meter with a non-freezing liquid, which does not injure the fittings; and this can be supplied at about 1s. 3d. per gallon.

Prices and all Information on Application.

NEW GRANGE WORKS, EDINBURGH.

HIGHEST AWARDS given for our WET and DRY METERS at

Exhibitions held at GLASGOW, CALCUTTA, and EDINBURGH.

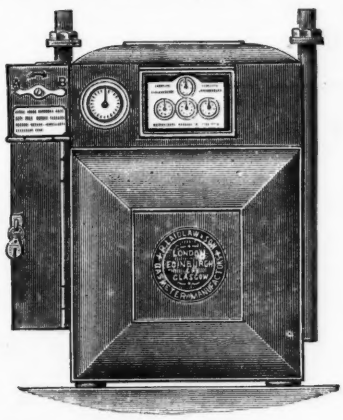
R. LAIDLAW & SON

GAS & WATER ENGINEERS.

MANUFACTURERS OF WET & DRY GAS-METERS,

SIEMENS WATER-METERS,

PREPAYMENT GAS-METERS.



—DRY METER.—

—WET METER.—

EDINBURGH: SIMON SQUARE WORKS. | **GLASGOW:** ALLIANCE FOUNDRY. | **LONDON:** 6, LITTLE BUSH LANE.

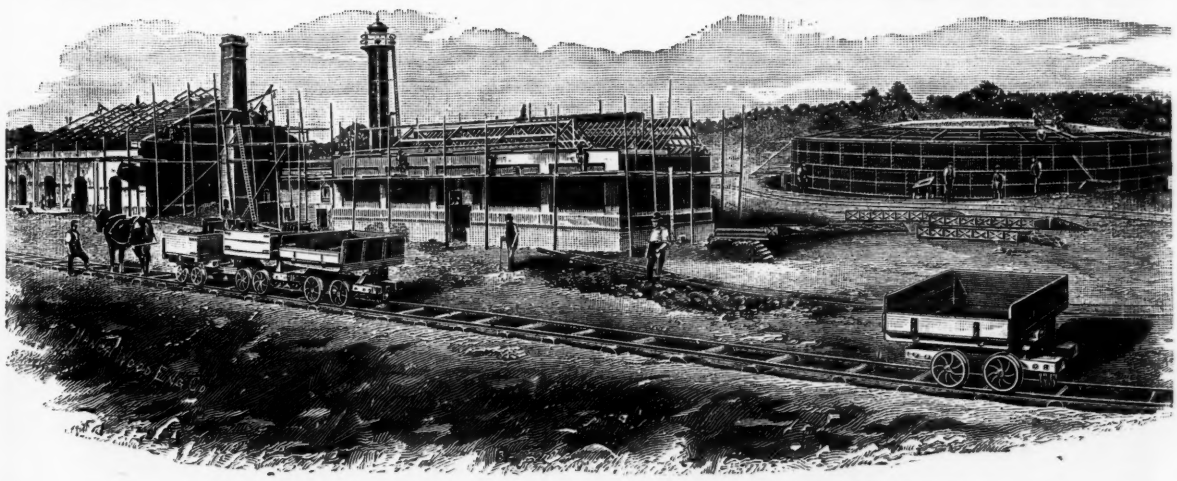
R. DEMPSTER & SONS,

LIMITED,

GAS ENGINEERS and CONTRACTORS,

ELLAND, YORKS.

ESTABLISHED 1855. **Telegrams: "DEMPSTER, ELLAND."**



Engraved from Photograph of Complete Gas-Works in course of Construction.

The WHOLE of the Apparatus, Foundations, Retort Work, Buildings, and Levelling of Site have been executed by our own Workmen. No Sub-Contracts.

Estimates and Illustrations for complete Works, or for any detailed parts, supplied gratis on application.
Tenders given for all kinds of Structural Ironwork.

ARROL-FOULIS

PATENT AUTOMATIC MACHINERY

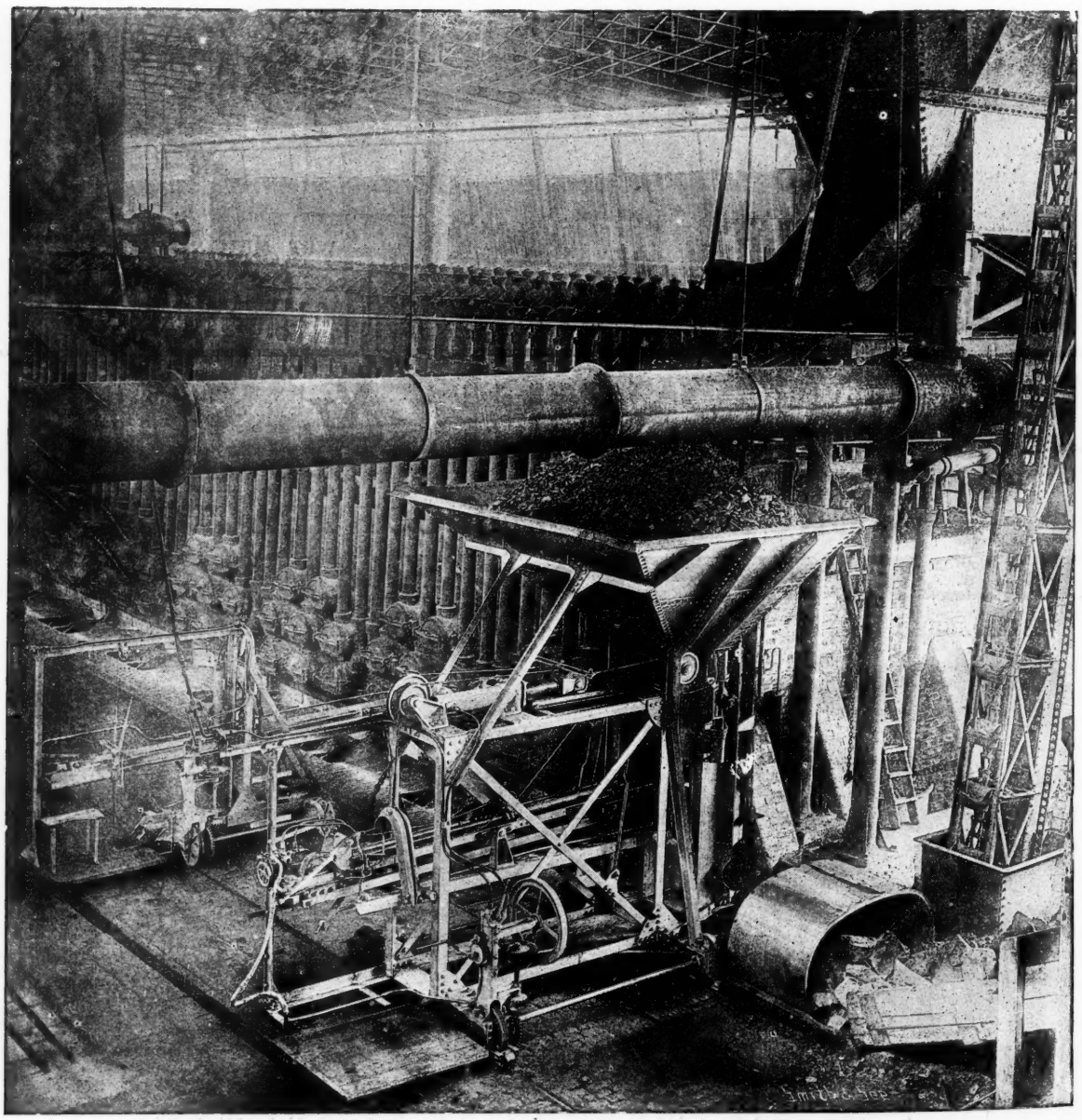
FOR

CHARGING AND DRAWING GAS-RETORTS

SIR WILLIAM ARROL & CO., Ltd., Sole Makers,

GLASGOW.

Plans and Estimates furnished on application.

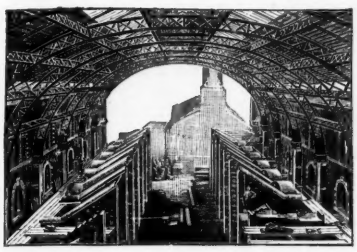


The above engraving shows the interior of a Retort-House at the Tradeston Gas-Works, Glasgow, where the Machines have been at work since the beginning of 1893, drawing and charging **960 Retorts every 24 hours.**

NEARLY 200 CHARGING and DRAWING MACHINES are at WORK or in COURSE OF CONSTRUCTION.

W. C. HOLMES & CO.

IRONFOUNDERS AND CONTRACTORS.

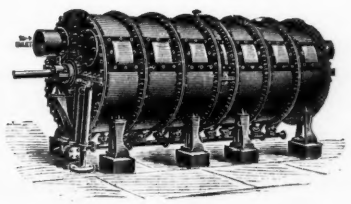


Makers of
GAS & CHEMICAL
PLANT.

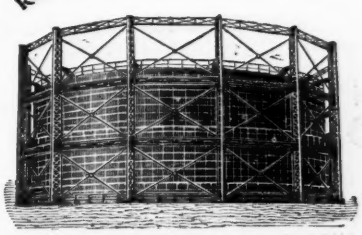
Telegrams:
"HOLMES, HUDDERSFIELD."

Improved
PATENT SCRUBBER-WASHERS,
All sizes,
From 50,000 to 5,000,000 Cubic Feet of Gas per day.
Results unrivalled. Send for Particulars and Prices.

MALLEABLE
and all Kinds of
CASTINGS.



GASHOLDERS of Improved Construction and of all Sizes.
ROOFS, BRIDGES, TANKS, GIRDERS.



Improved
BYE-PASS and
CENTRE-VALVES,
GOVERNORS,
and METERS.

Rotary or Pump
EXHAUSTERS.

80, CANNON STREET, LONDON,
AND
WHITESTONE IRON WORKS, HUDDERSFIELD.

GIBBONS BROTHERS, LIMITED,

Telegraphic Address:
"GIBBONS, DUDLEY."

DUDLEY,

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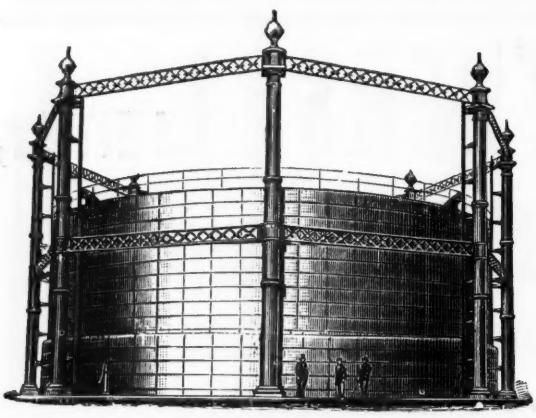

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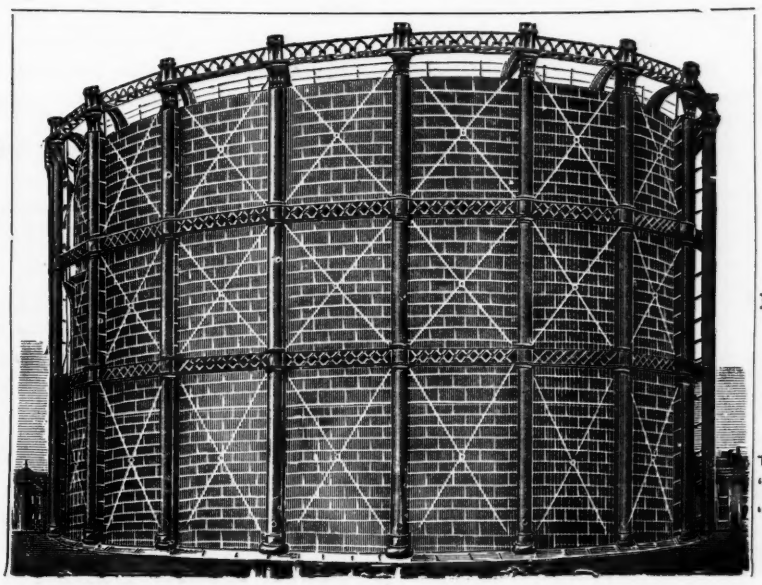

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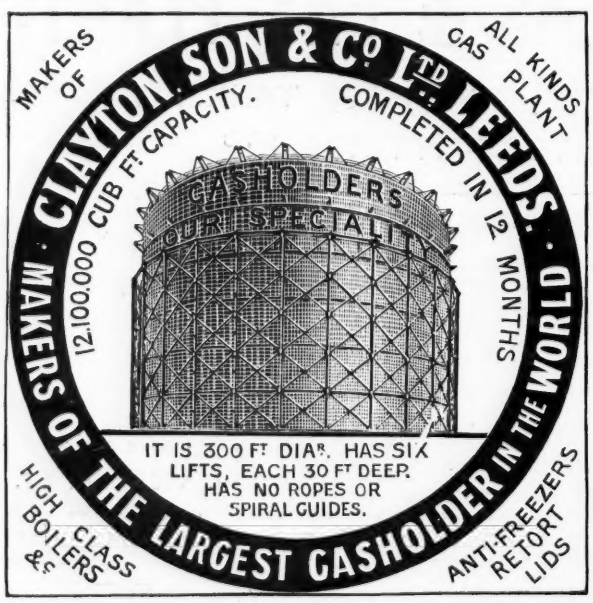
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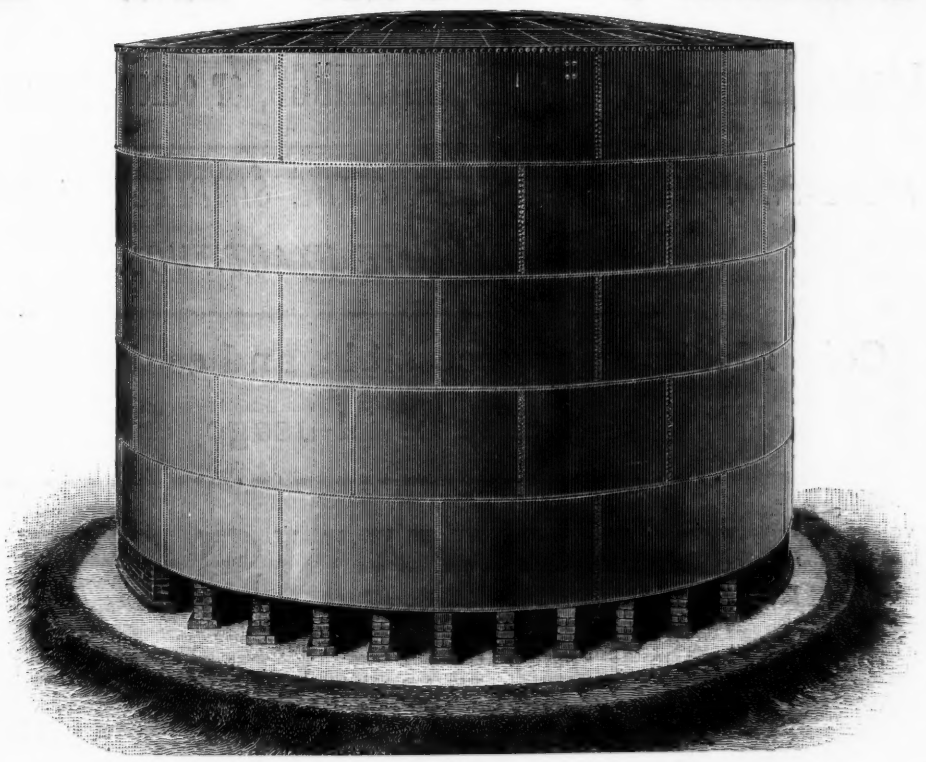

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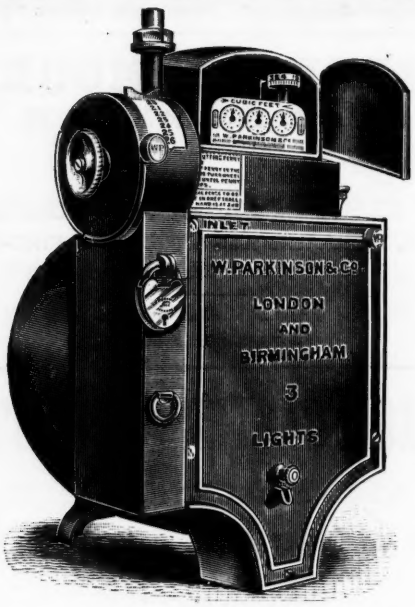

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[See also Advt. p. 980.

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